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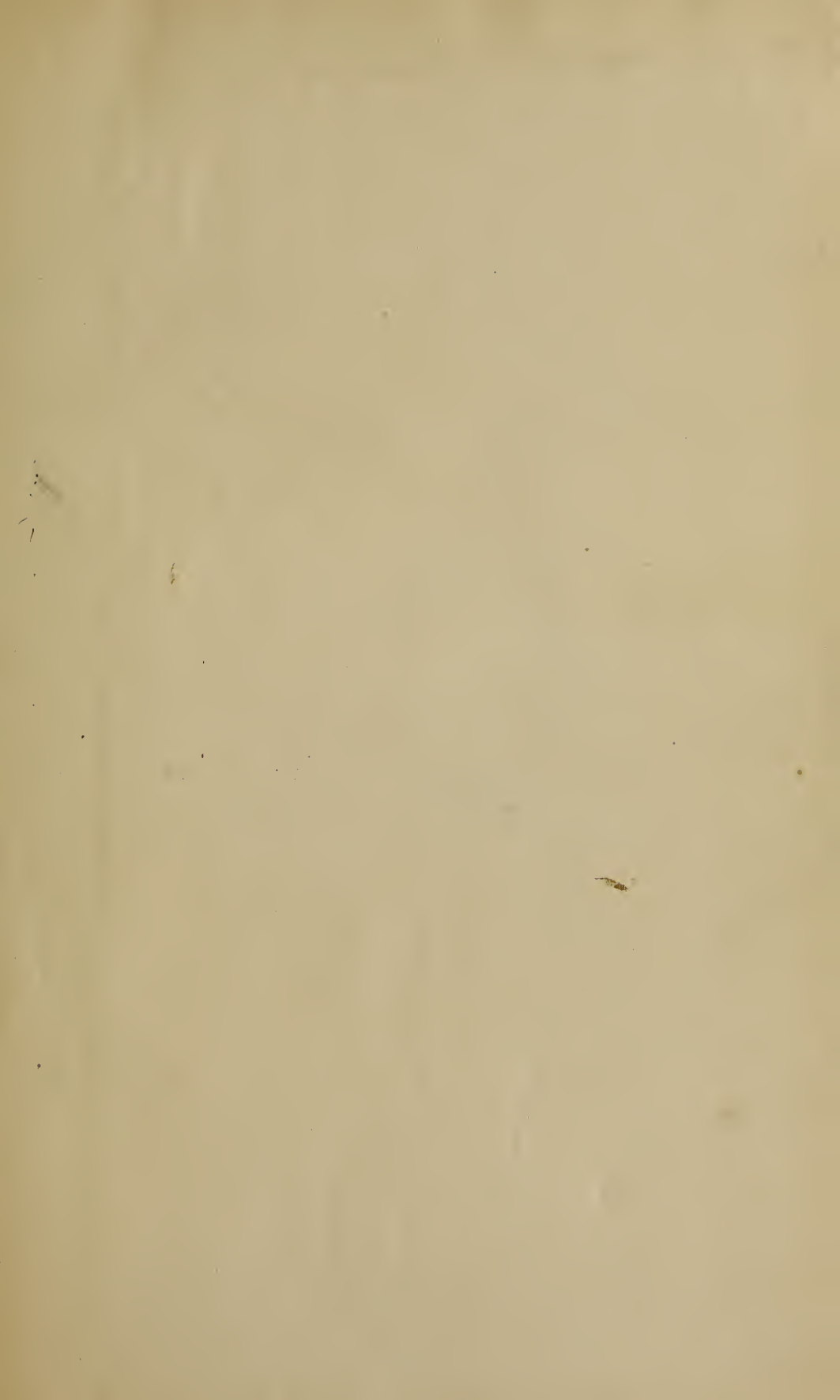
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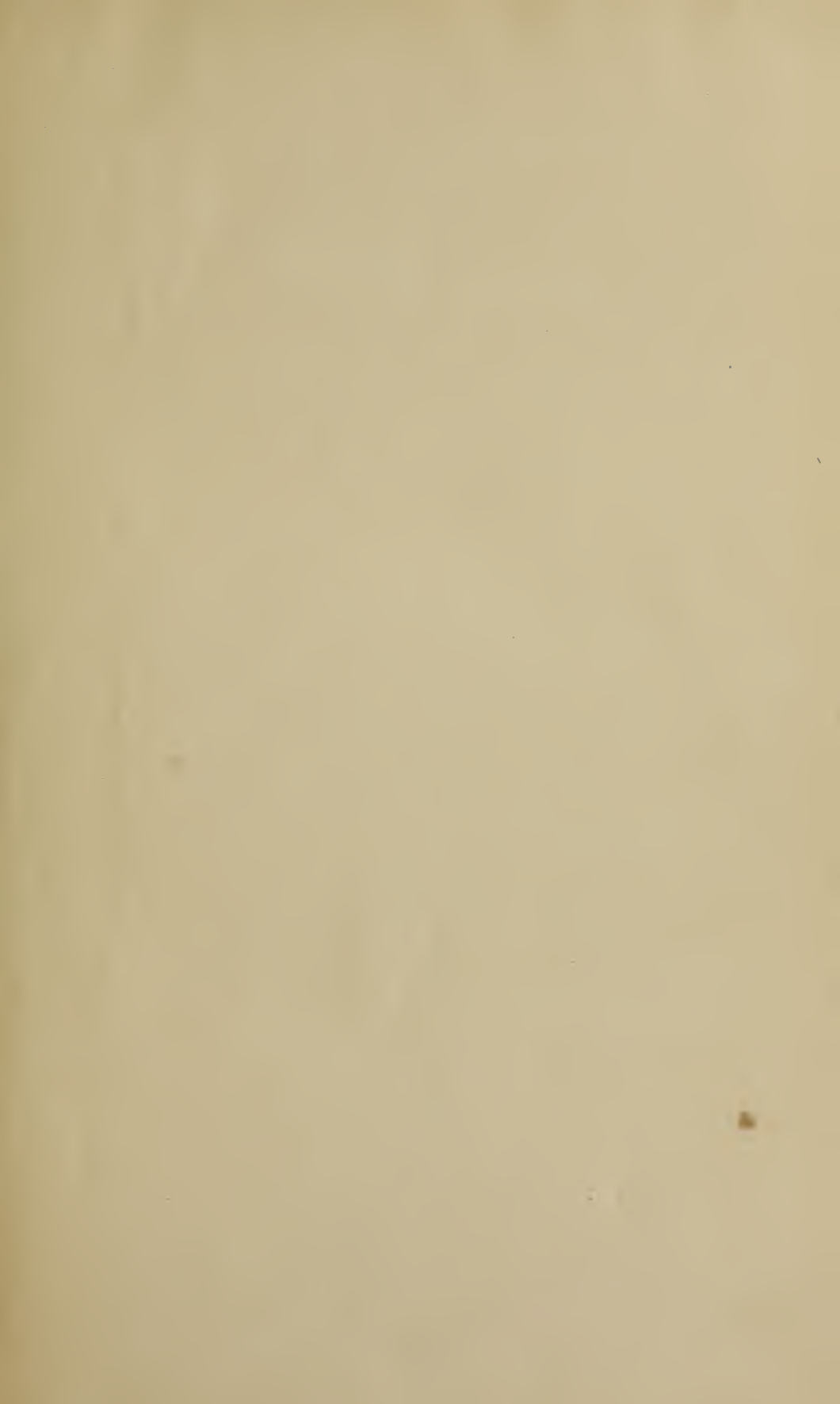
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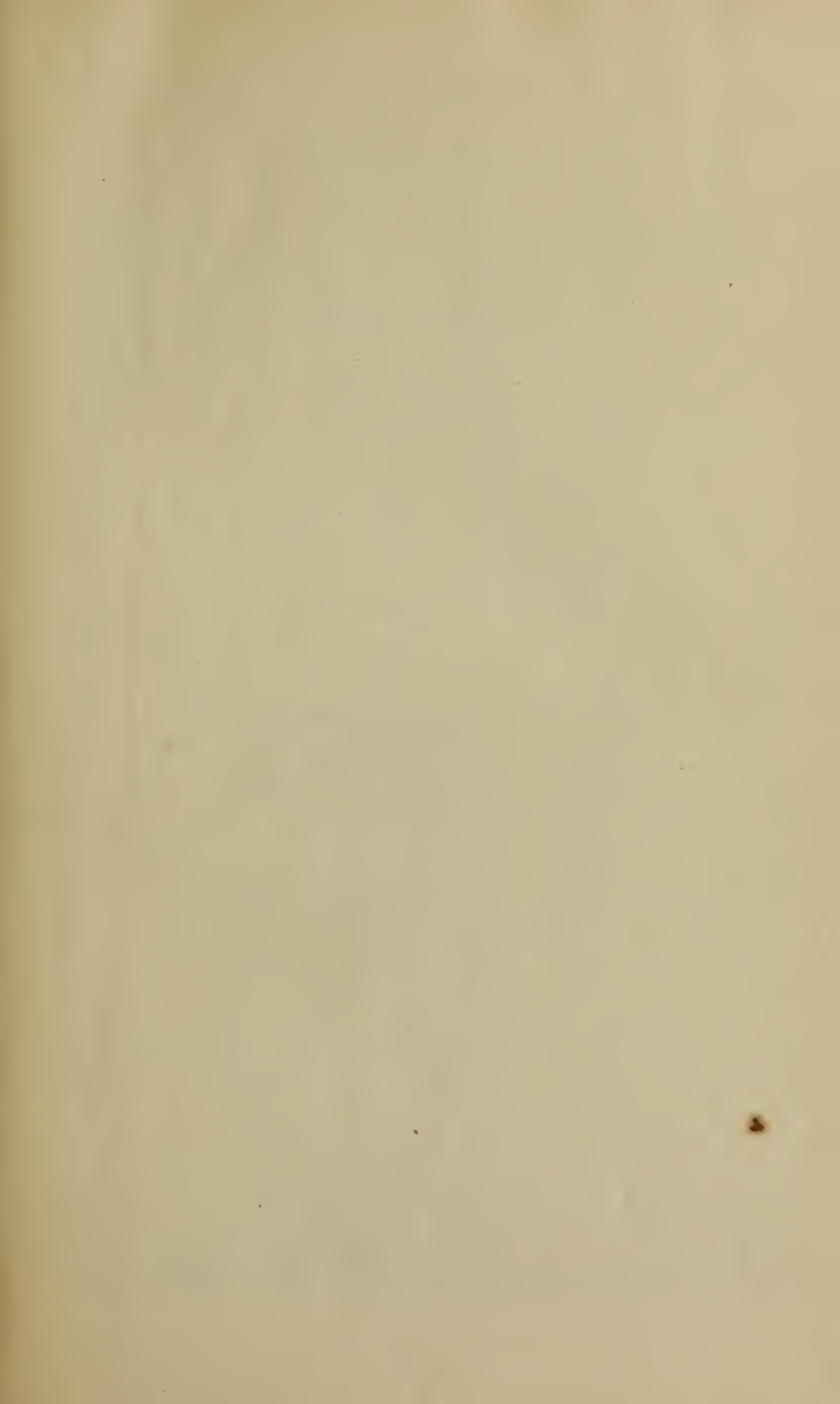
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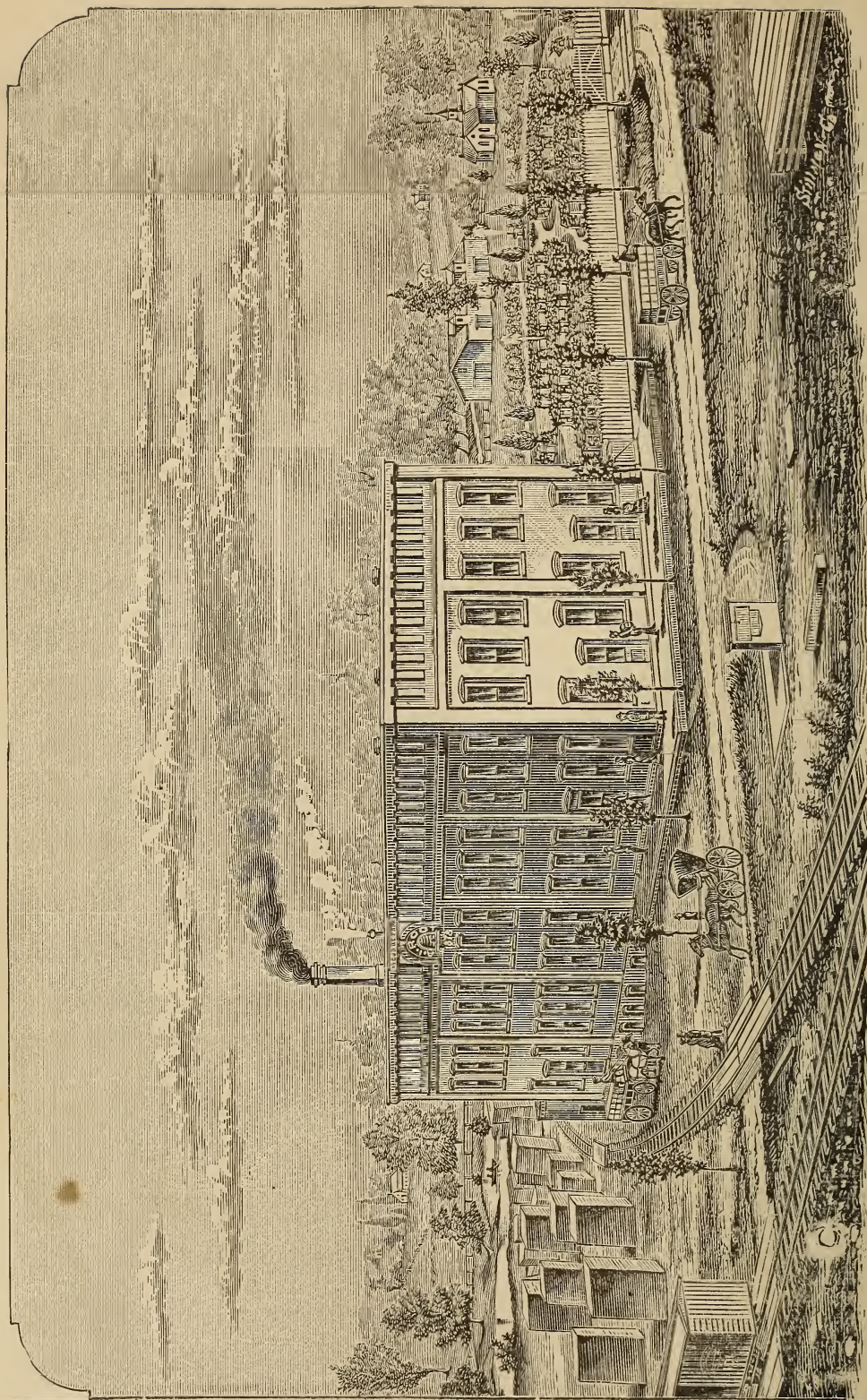
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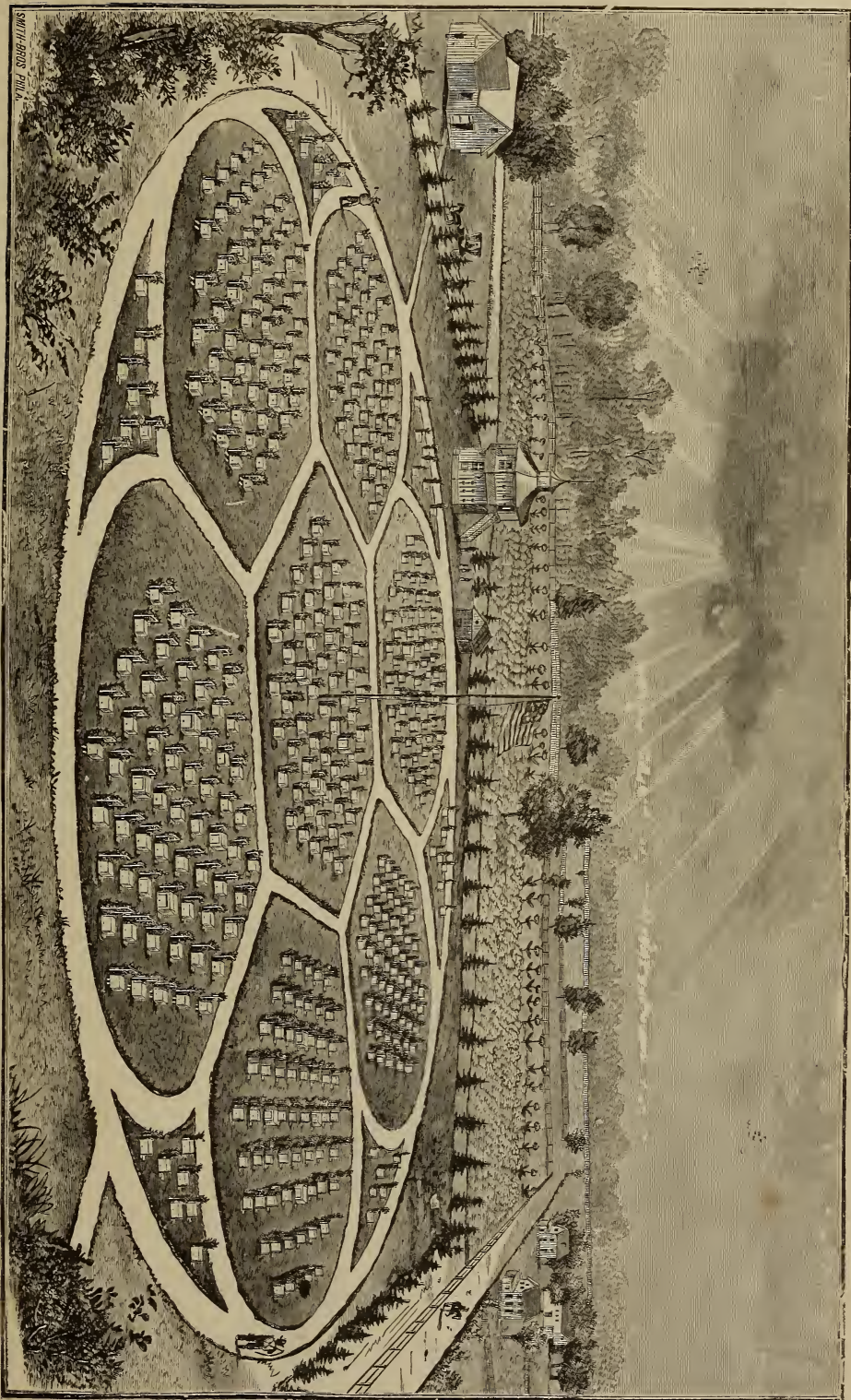








THE 'HONEY' OF THE HONEY B. E.



SMITHSONIAN INSTITUTION

THE HOME OF THE HONEY BEES—THE APIARY.
[This view is taken from the roof of the Factory.]



THE
A B C OF BEE CULTURE:

A CYCLOPÆDIA

OF

EVERYTHING PERTAINING TO THE CARE

OF THE

HONEY BEE :

BEEES, HONEY, HIVES, IMPLEMENTS, HONEY PLANTS, &c., &c. :

COMPILED FROM

FACTS GLEANED FROM THE EXPERIENCE OF THOUSANDS OF BEE-

KEEPERS, ALL OVER OUR LAND,

AND AFTERWARD VERIFIED BY PRACTICAL WORK IN

OUR OWN APIARY.

BY

A. I. ROOT.



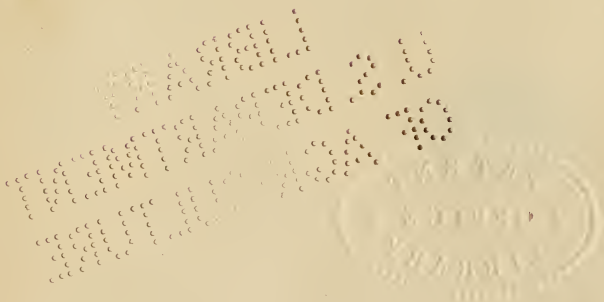
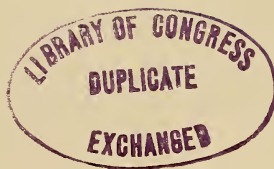
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A. I. ROOT.

1883.

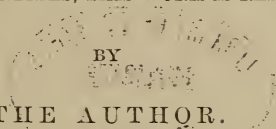
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TO THE
THRONGS OF EAGER, QUESTIONING BROTHERS AND SISTERS
IN THE
ART OF BEE CULTURE,
IN OUR OWN AND OTHER COUNTRIES, THIS WORK IS RESPECTFULLY DEDICATED
BY
THE AUTHOR.

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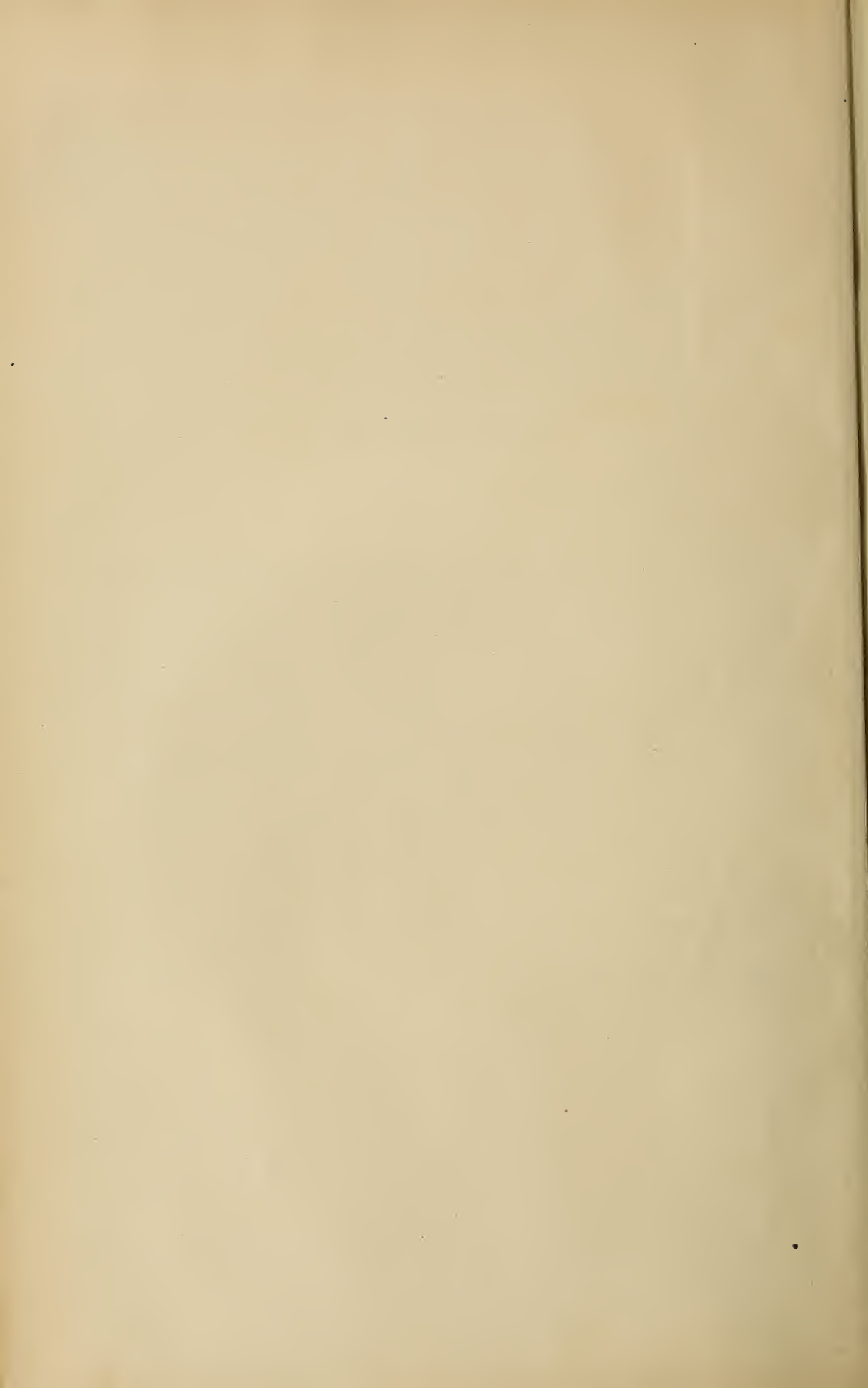


PREFACE.

In preparing this work, I have been much indebted to the books of Langstroth, Quinby, Prof. Cook, King, and some others, as well as to all the Bee-Journals; but, more than to all these, have I been indebted to the thousands of friends scattered far and wide, who have so kindly furnished the fullest particulars in regard to all the new improvements, as they have come up, in our beloved branch of rural industry. Those who questioned me so much, a few years ago, are now repaying by giving me such long kind letters in answer to any inquiry I may happen to make, that I often feel ashamed to think what meager answers I have been obliged to give them under similar circumstances. A great part of this A B C book is really the work of the people, and the task that devolves on me is to collect, condense, verify, and utilize, what has been scattered through thousands of letters, for years past. My own apiary has been greatly devoted to carefully testing each new device, invention, or process, as it came up; the task has been a very pleasant one, and, if the perusal of the following pages affords you as much pleasure, I shall feel amply repaid.

Medina, Ohio, Nov., 1877.

A. I. ROOT.



INTRODUCTION.

About the year 1865, during the month of August, a swarm of bees passed overhead where we were at work, and my fellow workman, in answer to some of my inquiries respecting their habits, asked what I would give for them. I, not dreaming he could by any means call them down, offered him a dollar, and he started after them. To my astonishment, he, in a short time, returned with them hived in a rough box he had hastily picked up, and, at that moment, I commenced learning my A B C in bee-culture. Before night, I had questioned not only the bees, but every one I knew, who could tell me anything about these strange new acquaintances of mine. Our books and papers were overhauled that evening, but the little that I found only puzzled me the more, and kindled anew the desire to explore and follow out this new hobby of mine; for, dear reader, I have been all my life *much* given to hobbies and new projects.

Farmers who had kept bees assured me that they once paid, when the country was new, but of late years they were of no profit, and every body was abandoning the business. I had some headstrong views in the matter, and in a few days I visited Cleveland, ostensibly on other business, but I had really little interest in any thing, until I could visit the book stores and look over the books on bees. I found but two, and I very quickly chose Langstroth. May God reward and forever bless Mr. Langstroth, for the kind and pleasant way in which he unfolds to his readers the truths and wonders of creation, to be found inside of a bee-hive.

What a gold mine that book seemed to me, as I looked it over on my journey home; never was romance so enticing; no, not even Robinson Crusoe: and best of all, right at my own home, I could live out and verify all the wonderful things told therein. Late as it was, I yet made an observatory hive, and raised queens from worker eggs before winter, and wound up by purchasing a queen of Mr. L. for \$20.00. I should, in fact, have wound up the whole business, queen and all, most effectually, had it not been for some timely advice toward Christmas, from a plain practical farmer near by. With his assistance, and by the purchase of some more bees, I brought all safely through the winter. Through Mr. L., I learned of Mr. Wagner; shortly afterward he was induced to re-commence the publication of the *American Bee Journal*, and through this, I gave accounts monthly, of my blunders and occasional successes.

Like many others, I could not be content without dabbling in patent hives, and in spite of good advice to the contrary, as soon as I was fairly started, I bought rights and thenceforth kept the most of my bees in American hives. After a trial of both kinds, the American and Langstroth, side by side, for 5 years, the combs were transferred from the American back to the L. frames. In 1867, news came across the ocean from Germany, of the honey extractor, and with the aid of a simple home-made machine, I took 1000 lbs. of honey from 20 stocks, and increased them to 35. This made quite a sensation, and numbers embarked in the new business, but when I lost all but 11 of the 35 the next winter, many said, "There! I told you how it would turn out."

I said nothing, but went to work quietly, and increased the 11 to 48, during the one season, not using the extractor at all. The 48 were wintered entirely without loss, and I think it was, mainly, because I took care and pains with each individual colony. From the 48, I secured 6,162 lbs. of extracted honey, and sold almost the entire crop for 25c. per lb. This capped the climax, and inquiries in regard to the new industry began to come in from

INTRODUCTION.

all sides; beginners were eager to know what hives to adopt, and where to get honey extractors. As the hives in use seemed very poorly adapted to the use of the extractor, and as the latter machines, offered for sale, were heavy and poorly adapted to the purpose, besides being "patented," there really seemed to be no other way before me than to manufacture these implements. Unless I did this, I should be compelled to undertake a correspondence that would occupy a great part of my time, without affording any compensation of any account. The fullest directions I knew how to give for making plain simple hives, &c., were from time to time published in the *A. B. J.*, but the demand for further particulars were such that a circular was printed, and shortly after, a second edition, then another, and another. These were intended to answer the greater part of the queries, and from the cheering words received in regard to them, it seemed the idea was a happy one.

Until 1873, all these circulars were sent out gratuitously; but at that time, it was deemed best to issue a quarterly at 25c per year, for the purpose of answering these inquiries. The very first number was received with such favor that it was immediately changed to a monthly, at 75c. The name given it was "GLEANINGS IN BEE CULTURE," and it was gradually enlarged until, in 1876, the price was changed to \$1.00. During all this time, it has served the purpose excellently, of answering questions as they come up, both old and new, and even if some new subscriber should ask in regard to something that had been discussed at length but a short time before, it was an easy matter to refer him to, or send him the number containing the subject in question.

GLEANINGS is now about commencing its eighth year, and inquirers do not like to be referred to something that was published a half-dozen years ago. Besides, the decisions that were then arrived at, may need to be considerably modified to meet the wants of the present time. Now, if we go over the whole matter again every year or two, for the benefit of those who have recently subscribed, we shall do our regular subscribers injustice, for they will justly complain that GLEANINGS is the same thing over and over again, year after year.

The best time to transfer bees is in the spring; and every spring, we have been besieged with so many inquiries that we, last spring, to avoid repetition, published the whole process at length in our circular; and we have since then given away 10,000 of these, paying postage ourselves. I know those who received them felt grateful for the kindness, for many of them said so; and I know, too, that they would have willingly paid us for them, were it not for the trouble it would have been for each separate person to have remitted us 3 or 5 cents.

Now you can see whence the necessity for this A B C book, its office, and the place we purpose to have it fill. In writing it, I have taken pains to thoroughly post myself in regard to each subject treated, not only by consulting all the books and Journals treating of bee-culture, which I have always ready at hand, but by going out into the fields, writing to those who can furnish information in that special direction, or by sacrificing a colony of bees, if need be, until I am perfectly satisfied. Still further; this book is all printed from type kept constantly standing, and as the sheets are printed only so fast as wanted, any thing that is discovered, at any future time, to be an error, can be promptly righted. For the same reason, all new inventions and discoveries that may come up — they are coming up constantly — can be embodied in the work just as soon as they have been tested sufficiently to entitle them to a place in such a work. In other words, I purpose it to be never out of date or behind the times. Begging your pardon for this lengthy introduction, we will, with your sanction, proceed to business. Nov., 1877.

Nearly two years have passed since the above was written. It is now July, 1879. The business has increased and developed so much, that we are now located on a piece of ground of 17 acres, and the picture in the front gives you a little idea of our building and surroundings. The apiaries of which you get a little glimpse, cover about 2½ acres; there are seven of them, like the hexagonal apiary shown in the back of this book. The central one has a flag in the centre of it, on which are the words, "By industry we thrive." The whole seven apiaries will accommodate 500 hives. We have, at this writing, 228 hives, mostly employed in queen rearing. Three or four boys and girls are constantly employed in rearing and shipping the queens. More are employed in making the hives and implements, and still more are at work on the journal, making this book, etc., etc. In fact,

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there are now between 70 and 80 of us, all together. Almost every trade and industry is represented in the building and on the grounds. We have all kinds of wood work, a tin-shop, carpenter-shop, blacksmith-shop, machine-shop, printing-office, book-bindery, sewing-room, paint shop, varnishing and japanning-room, wax-room where the comb foundation is made, a room where leather is worked considerably in making smokers, and we have almost everything except a grog-shop. There used to be two of those a year ago, just across the railroad, but both have closed up business now. I rather suspect the atmosphere we have brought into this part of the town was more than they could stand. If you should happen along here about noon, you would find that the engineer always stops the engine promptly at 10 minutes of noon, and that the hands then gather in the largest room in the building around an organ that they have purchased with their own money. In fact, it was purchased by each one's giving a day's work. After all join in singing a hymn, your humble servant is expected to read a verse or two from the Bible, and close the 10 minutes devotional exercise with a few brief remarks and prayer. I am often asked by visitors if this noon-day service was an idea of mine. I reply that it was as unexpected to me, as to any one else. It would be a long story, to tell how it originated. God brought it about, I am firmly persuaded. Do you wonder saloons do not prosper near us? Right over the open window at which I sit writing, is a stone bee hive which you can see in the picture. Over the hive is this inscription: "In God we trust." So long as we continue to trust in Him, and look to Him daily for help, the business will continue to prosper, and we shall be of use to ourselves, and to all those about us; but just so soon as we cease to trust in Him, the business will go down; saloons will spring up about us; and ruin and devastation will be the end. There are quite a number of us who know what it is to be frequenters of saloons, and who realize that it is by the grace of God we are kept where we are now. "It is not by might, nor by power, but by my Spirit, saith the Lord of hosts."

[OCTOBER, 1879.]

The following, descriptive of the picture of our apiary a few leaves back, is extracted from the November GLEANINGS.

THE HOME OF THE HONEY BEES.—AN APIARY OF 500 HIVES.

Isn't it pretty? Had you worked and planned and studied over it as we have, dear reader, you might perhaps appreciate it in a different way from what you do, but I am pretty sure you admire it any way. You observe there are 6 apiaries surrounding a central one, making 7 in all. There are 61 hives in each apiary, and the small apiaries of 7 hives each, in the corners, make the number nearly 500. The hives in each apiary are exactly 7 feet from center to center, and the streets are 24 feet broad. The gravel walks in the center of each street are 4 feet wide. The hives face different points of the compass, as explained in the back of this book. Coal cinders are placed around each hive to keep the weeds down, and then the space before and around the entrance is covered with clean, white sand. This is not only to give the bees a clean and pleasant door-yard, but it is to enable us, in passing, to see if all is right. For instance, if robbing has been going on, you will see the dead bees on the white sand, even if you are quite a distance away. Day before yesterday, in passing, I saw a young queen on the sand near the entrance of a hive, and out near the grass was another one.

"Hallo, Will," said I, "what does this mean?"

"Oh! I forgot to cut out those queen cells," said he, and he opened the hive "quicker," and found nine good cells, and two torn down. You see the white sand saved me 9 queen-cells, that one time.

The grass is all kept in nice trim, with the lawn-mower, and the labor is very much less, for so large an apiary, than to keep the ground clean with a hoe, as I have formerly recommended. It is now the middle of October, but the grass, in consequence of the frequent mowings, is as fresh and green as in June. To add to the beauty of it, dandelions have sprung up, and their bright yellow blossoms dotting the green here and there make a prettier picture than I can describe, especially as one or more Italians are found on every blossom, on pleasant days.

On the outside of the row of evergreens, which are planted for a wind break, is a carriage drive, and this drive extends off to the south, down by the pond, and through my creek-bottom garden. We planted 100 evergreens; only five of them died, and the nurseryman says he will replace those. Of 500 grapevines, planted last fall, I believe only about 7

INTRODUCTION.

died. The building with the wings is the honey house, as we call it. There we store all the tools and implements, all the empty hives, the sugar for feeding, etc. We are talking of a rail-road to run through the apiary into this house, but the light wheel-barrow seems to answer so well, we may not build it.

You will notice that the house apiary has changed so much that one would hardly recognize an old acquaintance. To Mr. Gray is the credit due for having made it so pretty, and so convenient for the bees, which we are just putting in the upper story. The old wooden roof used to leak some, and so we have put on a tin one. Leaking is a very bad feature for any roof, for hive or building. Tin, if kept painted, makes a sure thing of it. The chaff tenement-hive looks as large as life, or a little larger, and perhaps "twice as natural." You will observe, in the center of each apiary, or near the center, four chaff hives. These are to assist in giving landmarks, both to the bees and the apiarist. Just now we are giving chaff hives to all that we decide to winter. The apiary is not full of hives, as represented in the cut, but we number, house apiary and all, just 314. About two hundred will probably be preserved for wintering. The remainder we shall keep for those who want a queen very late; and, after the queen is sold, they will be united with the others. The grapevines, this season (the first), have been trained on a single stake, but they have made such a healthy growth, especially those which have been mowed around with the lawn-mower, that we shall have to get out 500 trellises, ready for next June.

I wanted the artist to get the inscription on the flag, but the letters would have been so small you probably could not have read it. Instead of a dozen or more rows of mammoth sunflowers, he has made only one, and these resemble some tropical plant more than those out in the field. The masses of foliage this side of the sunflowers represent the borage. It is yet in full bloom, and fairly covered with bees from morning till night, but nothing like the Simpson honey plant and the Spider flowers. The Spider flowers are growing right down at the right-hand corner; the Simpson plant, at the upper right-hand corner of the honey farm. The highway, where the man is riding along on horseback, runs east and west. I wish I could take you down by the pond and show you my creek-bottom garden; perhaps I will some day. I was at work in it this morning with my hoe, so early that I had to work by the light of the stars. I knelt in the soft rich ground (where the cultivator had been running the night before among the plants) and thanked God for this honey farm, and the opportunities it gives me of helping you all.

Sept. 2d, 1880.—We have had another year's experience with honey plants, and the result is such that I have decided to plant the whole of the available ground to Simpson and Spider plants. I have just been enjoying the dull season amazingly in underdraining our creek-bottom garden, and setting out Simpson plants. From seed planted in a cold frame in March, we now have beautiful plants humming with bees from daybreak until dark. A little less than one-fourth acre of Spider plants makes the most beautiful floral sight I ever beheld, and creates such a panic among the bees at dawn that you would think them robbing. The honey from them is very white, and beautiful in flavor.

June, 1882.—A kind Providence has still continued to prosper us, dear friends, and we have just issued the third number of JUVENILE GLEANINGS, supplementing the older GLEANINGS. Our building is now so crowded on every floor, that a new factory is in contemplation, and about one hundred hands are at work in the building and on the grounds. The children seem to have taken to the little bee journal as ducks take to water, and the number of their little letters now is greater than we can possibly find room for.

Jan., 1883.—During the season that is past, some of the largest crops of honey have been harvested ever known, and the progeny of a single queen has gathered pretty well toward the enormous quantity of 1000 lbs. of honey. The industry has in several directions begun to assume massive proportions. The demand for one-pound section boxes has been so great that single shipments have gone across the ocean, of nearly 100,000. Wax for comb foundation is getting scarce, and we begin to fear the product of the world will not supply the demand. A kind Father seems still smiling on us at the Home of the Honey-Bees.

Sept., 1883.—Our new factory is now nearly ready for occupation. During the summer we have employed between 140 and 150 hands. Two shorthand writers now take down what your humble servant dictates in regard to business and the matter for the journal, and each one is supplied with one of the latest improved type-writers, for copying the shorthand notes. The new factory is built on to the old one, on the right-hand side of the picture, so as to form a sort of wing, or L (see frontispiece), and extends from the old factory to the gate, seen in the margin of the picture. The trade in implements for bee culture has been larger than ever before known, and the production of honey has been correspondingly increased.

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THE A B C OF BEE CULTURE.

A.

ABSCONDING SWARMS.—Perhaps nothing is more aggravating in bee culture, than to have your bees all on a sudden “light out” for parts unknown, without so much as stopping to give you a parting word of farewell, or a single token of recognition of the debt they owe you, in the shape of gratitude for your past kindnesses in providing them with a home, shelter, etc. Perhaps no part of animated creation exhibits a greater love of home, than does the honey-bee; no matter how humble or uninviting the surroundings, they seem much attached to their home, and as they parade in front of their door-way after a hard day’s work, plainly indicate that they have a keen idea of the rights of ownership, and exhibit a willingness to give their lives freely, if need be, in defense of their hard-earned stores. It is difficult to understand how they can ever be willing to abandon it all, and with such sudden impulse, and common consent. No matter if they have never seen or heard of such a thing as a hollow tree, but have for innumerable bee generations been domesticated in hives made by human hands, none the less have they that instinctive longing that prompts them to seek the forest, as soon as they get loose from the chains of domestication. It is possible that the bees, as they go out foraging, keep an eye out for desirable places for starting new homes, and it may be that they have the hollow trees picked out some time before they decide to leave. Many incidents have been reported that pretty clearly show this to be the case. We once found our bees working strongly on a particular locality about a mile and a half from the apiary, where the white clover was blooming with most unusual luxuriance. Very soon after, a colony swarmed, and the bees, after pouring out of the hive, took a direct line for a tree in this clover-field, without so much as making any attempt to cluster at

all. Did they not figure out the advantage of having only a few rods instead of over a mile to carry their honey, after having patiently gathered it from the blossoms, little by little? Perhaps it will be well to remark here, that it is very unusual for a swarm to go to the woods without clustering; they usually hang from 15 minutes to an hour, and many times several hours; in fact, we have known them to hang over night; but perhaps it would be well to take care of them inside of 15 or 20 minutes, if we would make sure of them. Long before swarming time, hives should all be in readiness, and they should also be located just where the new colony is to stand, with the sawdust, grapevines, or whatever we decide to have, all in nice trim. If you are going to have a model apiary, please do not think of waiting until the bees swarm, before you lay it out, but take time by the forelock, and with careful deliberation decide where every hive shall be before it is peopled with bees, if you wish to keep ahead and keep your bees from taking “French leave.”

But they sometimes go off even after they *have* been carefully hived, some will say. We are well aware they do often go off after being hived, sometimes the same, and sometimes the next day; but are you sure the hiving was carefully done? We never feel satisfied unless we have given the new swarm at least one comb containing unsealed brood, and we have seldom had a swarm desert a hive when thus furnished, nor do we often hear of one’s doing so. With such hives as we shall describe, it is a very simple task, and takes but a minute to open a hive and get such a comb. And besides, if by any chance you should fail to get the queen when you hive the swarm, they would be supplied with the means of rearing another.

This plan of giving them unsealed brood does very well, if you can once get them into the hive, but it is necessarily somewhat like

the one of catching birds with a handful of salt; how are we to obviate losing the occasional swarm that goes off without clustering at all? or the quite frequent cases of coming out unobserved or when no one is at home? We are happy to say there is a very certain and sure remedy for all cases of first swarming, in having the wings of the queen clipped so she can not fly; this plan is in very general use and answers excellently for all first swarms; but alas, the after-swarms are the very ones that are most apt to abscond, and we can not clip the wings of *their* queens, because they have not yet taken their wedding flight. What shall we do? Candidly, I don't know of any better way than to watch carefully when they are to be expected, and then chase after them, climb trees, &c., until they are once got safely into a hive. If you think this too much trouble, prevent having after-swarms as we have advised under that head.

Clipping the wings of the queen prevents losing first swarms by absconding, it is true; but it does not always prevent losing the queen. She goes out with the bees as usual, and, after hopping about in front of the hive, sometimes gets ready to go back at about the same time that the bees do, after having discovered she is not in the crowd. Even if she gets some little distance from the hive, the loud hum they make as they return, will guide her home many times, but unless the apiarist is at hand at such times to look after affairs, many queens will be lost,* and the bees will rear a lot of young queens and go into after-swarming in good earnest, making even the first swarm an "after-swarm." A German friend, who knows little of bee culture, once told me my bees were swarming, and if I did not ring the bells, etc., they would certainly go to the woods. As I quietly picked up the queen in passing the hive, I told him if they started to go away, I would call them back. Sure enough, they did start for the woods, and had gone so far that I really began to be frightened myself, when, away in the distance, we saw them suddenly wheel about, and then return to the hive at our very feet. While he gave me credit of having some supernatural power over bees, I felt extremely glad I had taken precautions to clip all our queens' wings but a few days before. After this, I felt a little proud of my control over these wayward insects, until a fine swarm of Italians started off under similar circum-

stances, and despite my very complacent, positive remarks, to the effect that they would soon come home, they went off and staid "off." In a humbler, and I dare say, wiser frame of mind, I "investigated," and found they had joined with a very small third swarm of black bees, that had just come from one of a neighbor's hives. I tried to "explain," but it required a five-dollar bill to make matters so clear, that I could carry back my rousing swarm of yellow bees, and sort out the black unfertile queen, that they might be made to accept their own. Thus you see, my friends, how many a slip there is, in bee culture, between cup and lip, and how very important it is that you keep posted and also "post" yourself in some conspicuous place near or in the apiary if you allow natural swarming, and do not want your golden visions—and bees—to take to themselves wings and fly away.

ABSCONDING FOR WANT OF FOOD.

Perhaps bees oftener desert their hives because they are short of stores, than from any other cause; and, many times in the spring, they seem to desert because they are nearly out. The remedy, or rather preventive for this state of affairs, is so plain, that we need hardly discuss it. After they have swarmed out, and are put back into the hive, give them a heavy comb of sealed stores if you can; if not, feed them a little at a time, until they have plenty, and be sure that they have brood in the combs. If necessary, give them a comb of unsealed larvæ from some other hive, and then feed them until they have a great abundance of food. You should be ashamed of having bees abscond for want of food.

ABSCONDING IN EARLY SPRING.

This seems to occur just at a time when you can ill afford to lose a single bee; and worse still, only when our stocks are, generally, rather weak, so that we dislike the idea of losing any of them. In this case they do not, as a general thing, seem to care particularly for going to the woods, but rather take a fancy to pushing their way into some of the adjoining hives, and at times, a whole apiary will seem so crazy with the idea, as to become utterly demoralized.

A neighbor, who made a hobby of small hives—less than half the usual size—one fine April day, had as many as 40 colonies leave their hives and cluster together in all sorts of promiscuous combinations. To say that their owner was perplexed, would be stating the matter very mildly.

* Whenever these small figures occur, the reader is requested to turn to Doolittle's comments at the close of this book.

Similar cases, though perhaps not as bad, have been reported from time to time, ever since novices commenced to learn the science of bee culture, and although cases of swarming out in the spring were known once in a great while before the new improvements, they were nothing like the mania that has seemed to possess entire apiaries—small ones—since the time of artificial swarming, honey extractors, &c. We would by no means discourage these improvements, but only warn beginners against making too much haste to be rich. Do not divide or commence swarming your bees, until they are abundantly strong; have them go into winter quarters with an abundance of sealed honey in tough old combs as far as may be; give them hives with walls thick and warm, of some porous material, such as chaff or straw, with a good thickness of the same above; and you will have little cause to fear any trouble from bees absconding in the spring.

ABSCONDING NUCLEUS SWARMS.

This, like the above, seems an outgrowth of the artificial system of working with bees, especially the plan of rearing queens in nuclei formed of two or three frames five or six inches square. This small-hive system was much in vogue about the year 1865. For awhile all worked finely, but soon complaints began to be heard that the bees left their hives in a body, with the queen, whenever she attempted to take her flight to meet the drones. Giving them unsealed larvæ, to amuse and console themselves with while she was absent, was then advised, and it answered very well for a time, but eventually one after another began to declare they wanted no frame in the apiary for queen-rearing, smaller than the ordinary brood frame. Since this, but little has been heard in the way of complaints of this kind of absconding. Where one has the time to study these little swarms, there is something very interesting and amusing about them. We have had them do finely for several weeks, with perhaps no more than a good pint of bees. A good day's work, during clover bloom, would fill the hive completely, and the young queen, after commencing to lay, would often fill the combs by her second day's work; then if she turned up missing on the third day, we used to wonder what in the world was the matter. Sometimes these little swarms would be found hanging on a currant or raspberry bush, as quietly and demurely as if that was the way bees always did; at other times, when we had hunted

through all available places for a truant colony, and given them up in despair, they would come circling back and cluster quietly almost under our very (inexperienced) noses.

There is still another kind of absconding that seems to be for no other reason than that the bees are displeased with their hive, or its surroundings, and, at times, it seems rather difficult to assign any good reason for their having suddenly deserted. We have known a colony to swarm out and desert their hive because it was too cold and open, and we have known them to desert because the combs were soiled and filthy from dysentery in the spring. They very *often* swarm out, because they are out of stores, and this generally happens about the first day in spring that is sufficiently warm and sunny. We have known them to swarm out because their entrance was too large, and, if we are not mistaken, because it was too small. We have also known them to swarm out because they were so "pestered" with a neighboring ant hill—SEE ANTS—that they evidently thought patience ceased to be a virtue.

Many times, they swarm out in spring where no cause can be assigned than that they are weak and discouraged, and, in such cases they usually try to make their way into other colonies. While it may not always be possible to assign a reason for such behavior with medium or fair colonies, we may rest assured that good strong colonies, with ample supplies of sealed stores, seldom, if ever, go into any such foolishness.

By way of summing up, it may be well to say: if you would not lose your bees by natural swarming, clip the wings of all queens as soon as they commence laying, then look to them often, and know what is going on in the apiary every day during the swarming season; if you would not have runaway swarms in the spring, and while queens are being fertilized, confine your experiments to pecks of bees instead of pints.

AFTER-SWARMING.—We might define this by saying that all swarms that come out, or are led out by a VIRGIN QUEEN, are termed after-swarms; and all swarms that come out within ten or fifteen days after the first swarm, are accompanied by such queens. There may be from one all the way up to a half-dozen or even more, depending on the yield of honey, amount of brood or larvæ, and the weather; but whatever the number, they are all led off by queens reared from one lot of queen-cells, and the number of bees accompanying them is, of a

necessity, less each time. The last one frequently contains no more than a pint of bees, and, if hived in the old way, would be of little use under almost any circumstances; yet when supplied with combs already built and filled with honey, such as every enlightened apiarist should always keep in store, they may be made the very best of colonies, for they have young and vigorous queens, and often are equal to any in the apiary, the next season. This after-swarming is often considered a great nuisance, or misfortune; but where bees can be sold, at even tolerable figures, we would advise taking care of all that may come out in the manner indicated.² In fact, we know of no easier or simpler way of raising bees; but unless the apiary and bees in the vicinity are pretty thoroughly Italianized, there is much greater risk of getting poor hybrids than by the different ways of artificial swarming, where we rear our queen cells from choice selected brood.

There is one very amusing feature in regard to these after-swarms. When they have decided to send out no more swarms, all the young queens in the hive are sent out, or it may be, allowed to go out with the last one, and every few days during the swarming season, some "new hand" writes us about the wonderful fact of his having found three or four, or it may be a half-dozen queens in one swarm.³ On one occasion, a friend, who weighed something over 200, ascended to the top of an apple-tree during a hot July day, to hive a very small third swarm. He soon came down, in breathless haste, to inform us that the swarm was *all queens*, and in proof of it, brought two or three in his closed-up hands.

The queens, with these after-swarms, seldom lay in the drone cells at all the first season, and the bees therefore build almost entirely worker comb, which is additional reason for taking care of them, and supplying them with stores from other colonies. However, we would advise as a general rule, preventing too much after-swarming if it can be done without much trouble; but, if they will come out in spite of all we can do, take care of them in the manner indicated. While first swarms usually come out in the middle of the day, and take things in a regular, methodical way, as indeed we might expect a laying queen of age and experience to do, these after-swarms, that have queens not yet fertilized, are to be looked for at almost any time of day, from early in the morning until after sundown, and they may

also be expected to do all sorts of eccentric things, and to cluster in all sorts of places, or to go off into the woods without clustering at all.

Preventing after-swarming can generally be accomplished at least temporarily, by cutting out all queen cells but one, after the old queen with the first swarm has left.⁴ There are two objections to this plan however. The first is, that if the single cell left fails to produce a perfect queen, the colony is left queenless. The second is that they will sometimes—especially the Italians—swarm out with the only queen left, leaving the colony hopelessly queenless. With the extractor, or by the use of empty combs, we can almost invariably keep down the swarming fever, but if we work entirely for comb honey, even if the boxes are all supplied with foundation, we must expect to have more or less swarming. With box hives, perhaps the best we can do, is to hive the after-swarms near the old stock, and let them set until the next day; by this time all the queens will have been killed but one, and we can then kill her, shake the bees in front of their old hive, and all will be "lovely," or about as nearly so as things ever are with box hives.

Giving the old swarm a young fertile queen as soon as the first swarm has left, will usually prevent all second swarming, at least for the time being, for the laying queen will soon destroy all queen cells, or induce the bees to do so. A simpler method, and one that we believe succeeds almost invariably, is to move the old colony away as soon as the first swarm is out, and set the new one on the same stand.⁵ This has the effect of getting all the flying bees into the new swarm, and leaving the old one so destitute, that the queen that hatches first is allowed to destroy all the rest of the cells. By this plan, we are spared the trouble of opening the hive, but are obliged to carry each hive to a new stand as soon as it has swarmed. If the queen's wing is clipped, and we are at hand, we can manage swarming by this method very expeditiously. As soon as they commence swarming, pick up the queen and carry away the hive they are coming out of; place the new one in its stead and as soon as the bees commence coming back to look for her, put the queen among them, and your hive is swarmed without their clustering at all. This plan works excellently, and the bees go right to work apparently as perfectly satisfied as if they had clustered in the usual way. The only objection is that an inexperienced person might not find the

queen readily, and she might be lost; also, we are obliged to be on hand or risk losing our queens. It should be borne in mind that a swarm that issues a month or more after the first swarming, is not to be considered an after-swarm; for in this case it will be led out by a laying queen, or one that is old, compared with the queens just hatching. In regard to the oft-repeated advice to prevent after-swarming by removing all queen cells but one, it may be well to say that the Italians frequently swarm without constructing queen cells at all, and the beginner is sadly puzzled at finding nothing of the kind when he looks his hive over. Also, we may have several after swarms without having any first swarm at all, where the queen is killed or removed by accident. We once had a box-hive neighbor who was so much taken up with an observatory hive he saw at our house, that he at once went home and made one, and to get the bees, drummed out about a quart from one of his hives. He got the queen, and had a very fine one-comb hive in his parlor, but in a few days, the box hive she came from commenced swarming, and furnished him with more queens and small colonies than he knew what to do with.

AGE OF BEES.—It may be rather difficult to decide how long a worker bee would live, if kept from wearing itself out by the active labors of the field; six months certainly, and perhaps a year; but the average life during the summer time is not over three months, and perhaps during the height of the clover bloom, not over six or eight weeks. The matter is easily determined, by introducing an Italian queen to a hive of black bees, at different periods of the year. If done in May or June, we shall have all Italians in the fall and if we note when the last black bees hatch out, and the time when no black bees are to be found in the colony, we shall have a pretty accurate idea of the age of the blacks.⁶ The Italians will perhaps hold out under the same circumstances, a half longer. If we introduce the Italian queen in September, we shall find black bees in the hive until the month of May following—they may disappear a little earlier, or may be found some later, depending upon the time they commence to rear brood largely. The bees will live considerably longer if no brood is reared, as has been several times demonstrated in the case of strong queenless colonies. It is also pretty well established that black bees will live longer in the spring than Italians; probably because the latter are more inclined to push

out into the fields when the weather is too cool for them to do so with safety; they seldom do this however, unless a large amount of brood is on hand, and they are suffering for pollen or water.

During the summer months, the life of the worker bee is probably cut short by the wearing out of its wings, and we may, at the close of a warm day, find hundreds of these heavily laden, ragged-winged veterans making their way into the hives slowly and painfully, compared with the nimble and perfect-winged young bees. If we examine the ground around the apiary at nightfall, we may see numbers of these hopping about on the ground, evidently recognizing their own inability to be of any farther use to the community. We have repeatedly picked them up, and placed them in the entrance, but they usually seem only bent on crawling and hopping off out of the way, where they can die without hindering the teeming rising generation.

AGE OF DRONES.

It is somewhat difficult to decide upon the age of drones, because the poor fellows are so often hustled out of the way, for the simple reason that they are no longer wanted; but we may be safe in assuming it something less than the age of a worker. If kept constantly in a queenless hive, they might live for three or four months perhaps.

AGE OF THE QUEEN.

As the queen does little or no out-door work, and is seldom killed by violence as are the drones, we might expect her to live to a good old age, and this she does, despite her arduous oviparous duties. Some queens die, seemingly of old age, the second season, but generally they live through the second or third, and we have had them lay very well, even during the fourth year. They are seldom profitable after the third year, and the Italians will usually have a young queen "helping her mother" in her egg-laying duties, before she becomes unprofitable. If a very large amount of brood is found in a hive, two queens will often be found, busily employed, and this point should be remembered while seeking to introduce valuable queens.

ALIGHTING - BOARDS. — A few years ago, it was common to see bee hives perched upon benches or "legs," with grass and weeds so thick on the ground below, that if a heavily laden bee missed the hive, it was a chance if it picked its way out in a full half hour; but, at present, we usually see the hives so near the ground that those heavy-

ily laden with pollen or honey may go in on foot, if they find it more convenient so to do. If you doubt the utility of having the ground smooth and clean in front of the hives, it may be well to take a look at a hive set in the weeds and grass, and then at one prepared in the way we advise. Several years ago, we had a fine colony suspended from a pair of spring balances. It was in the height of the clover bloom, and the hive gained in weight during the day an even 10 lbs. As the hive was raised a couple of inches from the ground to suspend it, the bees, at about 9 o'clock, had fallen on the ground in quite a little cluster, where they paused to take breath, until they could again take wing to get into the hive. At this time, the spring balance showed a gain of an ounce every five minutes. To help them, a cloth was tacked from their old alighting board to the entrance of the hive; they then crawled in in a steady stream, and the dial of the balance at once showed a gain of one ounce in every *four* minutes. Other experiments seem to indicate very clearly that a good alighting board, or rather a free and unobstructed passage to the hive, is a very important matter.

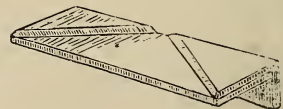
If any kind of a board is placed on the ground in front of the hives, it is sure to warp under the influence of the hot sun on one side, and the damp earth on the other. If we clamp it to prevent this, we have a place for toads, mice, and other vermin to lurk, and taking all things into consideration, we prefer white sand or sawdust spread directly on the ground. When this is first put down, it is blown about by the winds, and beaten down by the rains; but if you press it down when damp or wet, it will, when dry, hold its place nicely, is not affected by the weather, affords no lurking place under it, and gives an excellent foot hold for the bees when returning during a windy day. After the day's work is over, the sight of the bees congregated about in their "door-yard," is suggestive of peace and tranquility, to anyone who has studied the queer ways of these "little busybodies." So much attached, in fact, do they seem to become to the idea of keeping this little door-yard clean and tidy, that they will labor by the hour in trying to pull up any tiny blade of grass or weeds that may have the audacity to attempt to grow any where within a foot of their hives. This sawdust idea is also an excellent one, when we are watching or hunting queens with clipped wings in natural swarming. With a nicely kept door-

yard, you can get your eye on the queen, when several yards from the hive, when, otherwise, you might have to hunt in the grass and weeds for an hour, and then not find her.

With the house apiary, we are compelled to have a regular door-step, or alighting board, and these should be as broad as we can conveniently have them. Our own, are 14x10 inches, and are securely clamped, and painted on both sides. While the bees do fall to the ground, to some extent, during a heavy yield of honey, there is less trouble than we imagined, for they generally strike the broad alighting board. Another point that favors their easy ingress to the hives, is the 2 inch auger hole entrances. Many of the bees will shoot right into them, and alight safely on the combs; the auger hole seems to be a plain mark for them to aim at, even when some distance from their hive. Very likely it accords with their natural disposition of seeking hollows in the forest trees, and these entrances are not very unlike the knot holes they many times have for entrances in forest trees. It will be an excellent plan to keep the ground clean about the house apiaries also, that we may see when queens are being brought out during natural swarming, superseded, &c.

The old style of Langstroth hive, with its portico, furnishes a very convenient alighting board, but aside from the expense, and inconvenient projections on the front of the hive, we have found them very annoying on account of the excellent harbor they afford for spiders with their attendant webs. We might omit the roof, it is true, but then the rain would beat into the hive inconveniently. Taking all things into consideration, we much prefer the entrances as used with the Simplicity hive, and the alighting board or alighting ground rather, made of the packed down sawdust. See HIVES.

To those who insist on the three-cornered blocks and a board in front, for door step, we offer the following to be attached to any hive having a movable bottom. Get out of a $\frac{3}{4}$ board a piece $1\frac{1}{2}$ inches wide, and as long as the width of the front of your hive; now, a piece of the same length, and width, but only $\frac{3}{8}$ thick; nail these together as shown in the accompanying cut.



ALIGHTING-BOARD DETACHABLE.

The thick piece being nailed into the edge of the thin one, the three-cornered pieces are to be nailed on the top of both, and their shape and dimensions will be seen at a glance; they are to be only $\frac{3}{4}$ thick, for the entrance is contracted and enlarged by moving the hive backward or forward on the bottom board, and we wish them so that no mice can get in under any circumstances.

HOW TO SAW THE ENTRANCE BLOCKS.

When the entrance is very large, as in the summer time, the bees gain access by crawling up the sides of these blocks, and to facilitate this, we have blocks sawed on a bevel. This is very quickly and nicely done by cutting a rectangular board from one corner to the other as in the diagram. The dotted line represents the course of the saw. Now to produce the bevel, one corner of our square board, say C, is to be raised about two inches, while the opposite corner D, lies on the saw table; this is easily done by a strip, under C, that slides against the gauge while the saw cuts through on the dotted line, A B.



This alighting board guides the bees into the entrance, there are no loose blocks to be scattered about in the summer and get lost, it can be put on or taken off from any bottom board by turning two screws, and it will not permit storms to beat in at the entrance, even if no portico be used, for the top of the entrance blocks is on a level with the bottom of the hives. We would bank up with sawdust that the bees might get in easily, even if they fell a foot or two short of the hive when coming in.

These alighting boards can be furnished well made and neatly painted, for about ten cents each. We use them on all Simplicity hives, in our own apiary.

ALSIKE CLOVER.—This is a cross between the white and the red clover, and while it furnishes full as much honey as the red, the petals are so short that the bees find no difficulty in reaching it. If you imagine a large head of white clover, with the extremities of the petals tipped with a beautiful pink—equal in beauty to a dahlia if they were not so common—you will have a very good idea of the Alsike. The leaf is much like that of other clovers, except that, in color, it is a soft clean bright green, without the spots or down that are seen on the white or red.

If Alsike clover came into bloom at a season when bees could get little else, as buckwheat does, I should place it, instead of

buckwheat, first on the list of plants for artificial pasturage.* Where white clover does not grow spontaneously, Alsike is, undoubtedly, ahead of everything else now known. It not only produces honey in large quantities, but the quality is not excelled, by anything known in the world. It is true, many people will prefer basswood, mountain sage, and other aromatic flavors, at first taste, but I believe every one tires of these after a time, and clover stands almost alone, as the great staple for every day use, with, and like, our "bread and butter."

CULTIVATION, AND SOWING THE SEED.

The cultivation is so much like that of red clover, that what applies to the one, will do for the other. As the seed of the Alsike is much smaller, a less quantity is required; the general rule is four pounds to the acre. As it blossoms only the second year, or very sparingly the first, with ordinary cultivation, it may be sown almost any time, and in fact it is often sown on wheat on the snow in March. In this way, we can see just how evenly we are getting it on the ground. The farmers near me who furnish the finest seed, say they have the best success with that sown with their oats in the spring. Although Alsike will produce some honey with almost any cultivation, it is important to have the ground nicely prepared, if we wish to get large yields of either hay or honey. With good mellow ground, finely pulverized, we may get a growth of 3 feet in height, and a profusion of highly colored blossoms, that will astonish one who has never seen such a sight; especially when the field is roaring with the hum of the busy Italians. As a heavy growth is liable to lodge badly during wet weather, it may be well to sow a sprinkling of timothy seed with it. If put in early, it may on good soil produce considerable bloom the first season, but not much is to be expected until the second year, when it is at its height. It will give a fair crop the third year, but after that, if we would keep up a yield of honey, it must be sown again. It may be sown in the spring on fall wheat, but where timothy has been sown with the wheat in the fall, it is apt, on some soils, to choke out the Alsike.

SAVING THE HAY.

If raised for the hay and honey, without any reference to saving the seed, it will give, at least, two good crops every season; in this case, it is cut when in full bloom. In our locality, it usually blooms the last of

*If Alsike is cut, or even pastured off, just before coming into bloom, it will blossom again, just after white clover is gone, and give a crop of clover honey just when we most need it. One of our leading honey men, says this fact alone, learned at a convention, has been worth more than \$50.00 to him.

June, and sometimes furnishes considerable honey before the white clover is out. The hay is admitted by all, to be equal to any of the grasses or clovers in use, and the pasturage after the clover is cut, is most excellent for all kinds of stock.

SAVING THE SEED.

The seed is always saved from the first crop of blossoms, and it should be allowed to stand about two weeks longer than when cut for hay. If you wish to get a good price for your seed, it must be very nicely cleaned. It is threshed out with a clover huller, made expressly for clover seed, and then cleaned by a fanning mill, with the appropriate sieves. As timothy seed is very nearly of the same size, it is difficult to remove it all, unless by a fanning mill having the proper blast arrangement. As the Alsike weighs 60 lbs. to the bushel, and timothy only 45, there is no great difficulty in doing it effectually.

I need scarcely add that whoever raises seed for sale, should exercise the most scrupulous care, to avoid sending out foul seeds of any kind, and where Canada thistles or weeds of that class prevail, I would, under no circumstances, think of raising seed to be sent all over the land. If they are in your neighborhood, raise hay and honey, and let seed be furnished by some one who is differently situated.

PROFIT OF THE CROP.

The seed has for a number of years sold readily, for about \$12.00 per bushel, and the average yield of seed, is about four bushels per acre. It retails for about 25 cents per pound, and 60 lbs. is reckoned as a bushel. See CLOVER.

ANGER OF BEES. I confess I do not like the term "anger," when applied to bees, and it almost makes me angry when I hear people speak of their being "mad," as if they were always in a towering rage, and delight in inflicting exquisite pain on everything and everybody coming near them. Bees are, on the contrary, the pleasantest, most sociable, genial and good natured little fellows one meets in all animated creation, when one understands them. Why, we can tear their beautiful comb all to bits right before their very eyes, and, without a particle of resentment, but with all the patience in the world, they will at once set to work to repair it, and that, too, without a word of remonstrance. If you pinch them, they will sting, and any body that has energy enough to take care of himself, would do as much had he the weapon.

We as yet know very little of bees comparatively, and the more we learn, the easier we find it to be to get along without any clashing in regard to who shall be master. In fact, we take all their honey now, almost as fast as they gather it, and even if we are so thoughtless as to starve them to death, no word of complaint is made.

There are a few circumstances, under which bees seem "cross," and, although we may not be able to account exactly for it, we can take precautions to avoid these unpleasant features, by a little care. A few years ago, a very intelligent friend procured some Italians, an extractor, &c., and commenced bee culture. He soon learned to handle them, and succeeded finely; when it came time to extract, the whole business went on so easily, that they were surprised at what had been said about experienced hands being needed to do the work. They had been in the habit of doing this work as I had directed, towards the middle of the day, while the great mass of the bees were in the fields, but in the midst of a heavy yield of clover honey, when the hives were full to overflowing, they were one day stopped by a heavy thunder shower. This of course drove the bees home, and at the same time washed the honey out of the blossoms so completely that they had nothing to do but remain in the hives until more was secreted. Not so with their energetic and enthusiastic owner; as soon as the rain had ceased, the hives were again opened and an attempt made to take out the frames, as but an hour before, but the bees that were all gentleness then, seemed now possessed of the very spirit of mischief and malice, and when all hands had been severely stung, they concluded that prudence was the better part of valor and stopped operations for the day.⁷ While loads of honey were coming in all the while, and every bee rejoicing, none were disposed to be cross; but after the shower, all hands were standing around idle, and when a hive was opened, each was ready to take a grab from his neighbor, and the result was a free fight in a very short time. I know of nothing in the world that will induce bees to sting with such wicked recklessness, as to have them get to quarrelling over combs or honey left exposed when they have nothing to do. From a little carelessness in this respect, and nothing else, I have seen a whole apiary so demoralized that people were stung when passing along the street several rods distant. During the middle of the day, when bees were

busily engaged on the flowers, during a good yield, I have frequently left filled combs standing on the top of a hive from noon until supper time without a bee touching them; but to do this after a hard rain, or at a time when little or no honey is to be gathered in the fields, might result in the ruin of several colonies, and you and your bees' being voted a nuisance by the whole neighborhood.

Almost every season, we get more or less letters complaining that the bees have suddenly become so cross as to be almost unmanageable, and these letters come along in July, after the clover and linden have begun to slack up. The bees are not so very unlike mankind after all, and all you have to do is to avoid opening the hives for a few days, until they get used to the sudden disappointment of having the avenues through which they were getting wealth so rapidly, cut off. After a week or ten days, they will be almost as gentle as in the times when they gathered half a gallon of honey daily, if you are only careful about leaving hives open too long, or leaving any bits of honey or comb about.

Within a few feet of me sits a young man who once laughed about being afraid of bees, and commenced work in the apiary with such an earnest good will that I had high aspirations for him. One beautiful morning, he was tacking rabbits into the hives in front of the door to the honey house, whistling away, as happy as the bees that were humming so merrily about his head. Pretty soon, I saw some honey and bits of combs that had dropped from one of the hives, scattered about on the ground. I told him he had better stop and clean it up, or he would certainly get stung; as the bees seemed very peaceable while licking it up, he thought he would let them have it, in spite of my warning. After they had taken all the honey, they began buzzing about for more, and not finding any, in a very ungenerous way, commenced stinging him for his kindness. His lesson was a more severe one than I had expected, for they not only drove him from the apiary that morning, but I fear for all time to come, for although years have passed, he has never since wanted anything more to do with bees. I regret that he did not, at the time, also learn the folly of insisting on having his own way.

I can not tell you, at present, why bees sting so coolly and vindictively just after having had a taste of stolen sweets, yet nearly all the experience I have had of trouble with stinging, has been from this

very cause. Bees from colonies that have a habit of robbing, will buzz about ones ears and eyes for hours, seeming to delight in making one nervous and fidgety, if they succeed in so doing, and they not only threaten, but oftentimes inflict, the most painful stings, and then buzz about in an infuriated way, as if frantic because unable to sting you a dozen times more after their sting is lost. The colonies that furnish this class of bees are generally hybrid, or perhaps black bees having just a trace of Italian blood. These bees seem to have a perfect passion for following you about, and buzzing before your nose from one side to the other (until you get cross-eyed in trying to follow their erratic oscillations), in a way that is most especially provoking. One such colony annoyed us so much while extracting, that we killed the queen, although she was very prolific, and substituted a full blood Italian. Although it is seldom a pure Italian follows one about in the manner mentioned, yet an occasional colony may contain bees that do it; at least we have found such, where the workers were all three banded. That it is possible to have an apiary without any such disagreeable bees, we have several times demonstrated, but oftentimes you will have to discard some of your very best honey gatherers, to be entirely rid of them.

With a little practice, the apiarist will tell as soon as he comes near the apiary, whether any angry bees are about, by the high keynote they utter when on the wing. It is well known that, with meal feeding we have perfect tranquillity although bees from every hive in the apiary may be working on a square yard of meal. Now, should we substitute honey for the meal, we should have a perfect "row;" for a taste of honey found in the open air during a dearth of pasturage, or at a time when your bees have learned to get it by stealing instead of honest industry seems to have the effect of setting every bee crazy. In some experiments to determine how and why this result came about, we had considerable experience with angry bees. After they had been robbing, and had become tranquil, we tried them with dry sugar; the quarrelsome bees fought about it for a short time, but soon resumed their regular business of hanging about the well filled hives, trying to creep into every crack and crevice, and making themselves generally disagreeable all round. If a hive was to be opened, they were into it almost before the cover was raised, and then resulted a pitched battle between them and the inmates; the

operator was sure to be stung by one or both parties, and, pretty soon, some of the good people in-doors would be asking what in the world made the bees so awfully cross, saying that they even came in-doors and tried to sting. Now, why could they not work peaceably on the sugar as they do on the meal, or the clover blossoms in June? We dampened the sugar with a sprinkler, and the bees that were at work on it soon started for home with a load; then began the high key note of robbing, faint at first, then louder and louder, until I began to be almost frightened at the mischief that might ensue. When the dampness was all licked up, they soon subsided into their usual condition. The effect of feeding honey in the open air, is very much worse than from feeding any kind of syrup, and syrup from white sugar incites robbing in a much greater degree than that from brown sugar; the latter is so little relished by them that they only use it when little else is to be found. It is by the use of damp brown sugar that we get rid of the greater part of what are usually termed angry bees, or bees that prefer to prowling round, robbing and stinging, rather than gather honey "all the day," as the greater part of the population of the apiary does. The sugar should be located several rods away, and should be well protected from the rain, but in such a way as to allow the bees to have free access. When no flowers are in bloom, they will work on it in great numbers, but when honey is to be found, you will see none but the prowling robbers round it. These, you will very soon notice, are mostly common bees and those having a very little Italian blood. We have seen Italians storing honey in boxes, while the common bees did nothing but work in the sugar barrels. Where you work without a veil, it is very convenient to have these annoying bees out of the way, and, even if they belong to our neighbors, we prefer to furnish them with all the cheap sugar they can lick up.

The remarks that have been made are particularly for large apiaries; where one has only a single hive and no neighbors who keep bees, the case is something like Robinson Crusoe on the Island; no chance for stealing, and consequently nothing to be cross about. Bees are seldom cross or angry, unless through some fault or carelessness of your own.

ANTS. Although I have given the matter considerable attention, I can not find that ants are guilty of anything that should

warrant the apiarist in waging any very determined warfare against them. Some years ago, a visitor frightened me by saying that the ants about my apiary would steal every drop of honey as fast as the bees could gather it. Accordingly, I prepared myself with a tea-kettle of boiling water, and not only killed the ants, but some of the grape vines also. Afterward there came a spring when the bees, all but about eleven colonies, dwindled away and died, and the hives filled with honey, scattered about the apiary unprotected, seemed to be about as fair a chance for the ants that had not "dwindled" a particle, as they could well ask for. I watched to see how fast they would carry away the honey, but, to my astonishment, they seemed to care more for the hives that contained bees, than for those containing only honey. I soon determined that it was the warmth from the cluster, that especially attracted them, and as the hives were directly on the ground, the ants soon moved into several that contained only a small cluster and for awhile both used one common entrance. As the bees increased, they began to show a decided aversion to having two families in the same house, although the ants were evidently inclined to be peaceable enough, until the bees tried to "push" matters, when they turned about and showed themselves fully able to hold possession. The bees seemed to be studying over the matter for a while, and finally I found them one day taking the ants, one by one, and carrying them high up in the air, and letting them drop at such a distance from their home, that they would surely never be able to walk back again. The bees, as fast as they became good strong colonies, drove the ants out, and our experience ever since has been, that a *good* colony of bees is never in any danger of being troubled in the least by ants. One weak colony, after battling awhile with a strong nest of the ants, swarmed out; but they might have done this any way, so we do not lay much blame to the ants.

Ants sometimes annoy us very much by getting into barrels of honey, sugar, &c., and I do not know of any way of remedying the mischief except to get them out, and then keep them out. The cloth covers we use for our extractors, we find very convenient for keeping them out of barrels. Slip the cloth over the top of the barrel and press the upper hoop over it, and no ant can force its way in. Sugar boxes are made with tight fitting covers on purpose. Sometimes, it is quite convenient to protect the

contents of a table, by setting the feet in dishes of water; but we have seldom found them so troublesome as to be obliged to resort to such measures.

Ants frequently kill the young grapevines, and young plants and trees of different kinds, and it may be well therefore to know how to get rid of them pleasantly and easily. I really can not feel like recommending boiling water, on account of its cruelty; besides the danger of killing our vines, &c., by its use. It is well known, that where things do not please them, they are much disposed to "pull up stakes" and "abscond," very much in the way the bees do; and the simplest way we know of inducing them to do this, is to sprinkle powdered borax about their hills. After the first rain, you will see them forming a "caravan," lugging their larvæ, stores, &c., to a place where they are not annoyed by the disagreeable soapy borax. Spots in our apiary, where they have been on hand every season for years, have been permanently vacated after one application of this simple remedy. If they make troublesome "trains" running into the pantry, honey-house, &c., you are to follow them out to their nest, and there apply the borax. As I have said before, I have not been able to discover that ants have any particular liking for honey, and I should take very little trouble to drive them away, unless they got into the liquid honey and got drowned or something of that kind. By making their habits and instincts a careful study, we shall probably get at the readiest means of banishing them, and we may also discover that they are no enemy after all, as has often been the case with many of the insect and feathered tribes. Let us try to be as neighborly as we consistently can, with all these wonderful little creatures, that, in a certain sense, are fellow travelers in this world of ours.*

APIARIST. One who keeps bees, or a bee-keeper; and the place where he keeps his bees, is called an

APIARY. As you can not well aspire to be the former until you are possessed of the latter, we will proceed to start an apiary.

LOCATION.

There is scarcely a spot on the surface of the earth where mankind find sustenance, that will not, to some extent, support bees, although they may do much better in some localities than in others. A few years ago, it was thought that only localities especially favored, would give large honey crops, but

since the introduction of the Italians, and the new methods of management, we are each year astonished to hear of great yields here and there, and from almost every quarter of the globe. It will certainly pay to try a hive or two of bees, no matter where you may be located.

Bees are kept with much profit, even in the heart of some of our largest cities. In this case, the apiary is usually located on the roof of the building, that the bees may be less likely to frighten nervous people, and those unacquainted with their habits. Such an apiary would be established like those on the ground in all essential points.

Select a spot near the dwelling, and, if possible, have it where you will be likely to cast your eye every time you pass out or in. Although trees can scarcely be said to be objectionable, we believe we would prefer a clear piece of ground, that we might supply the shade to our liking. It will be an excellent investment of your time or money to have the plat nicely cleaned of all rubbish, and the ground leveled as far as may be; if you can get it in the condition of a brick yard all the better; a gentle slope would be desirable, and although a slope to the south and east has been thought best, we are not sure that it makes any particular difference. As we wish the ground to dry quickly after showers, it will be an excellent plan to have it all underdrained. If you can not well do this, make open ditches around the outside, or wherever water seems disposed to stand. The ground should be a little higher than the surrounding land, for this very reason, and you should be careful that no low places are left where the water may collect and stand around or near the hives.

Bees ascend with difficulty when heavily laden, and on this account we would have the apiary located in a valley, rather than on a hill, that they may rise as they go in quest of stores, and then have a downward slope as they come in with their loads. They will also suffer less from the effects of heavy winds, when given a home on rather low ground.

WIND-BREAKS.

A tight board fence should surround the plat, at least on the north and west sides, to keep off cold winds, and if it can be made strong enough to stand the prevailing winds it will be all the better to have it as much as 8 feet high. We would by all means advise having some kind of an enclosure that will exclude poultry, dogs, etc. A flock of "enterprising" hens will make more disorder in

* Since the above was written, several cases have been reported from the South, of ants killing caged queens, and queens that have been liberated on hatching brood as per directions in INTRODUCING QUEENS. These cases, of course, occurred when the number of bees was too small to properly protect themselves.

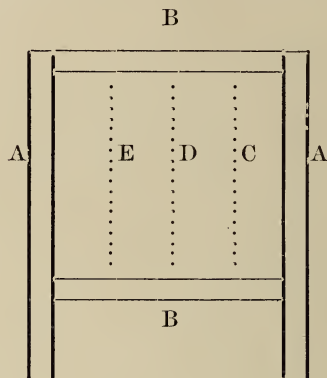
a few hours in a well-kept apiary than the owner can restore in a half day. We wish to have the ground so clean that we can get down on our knees, in front of any hive, at any time. This we can not do in any enclosure where poultry have free access. The high strong fence will also do much to discourage thieves from attempting to pillage the honey, for climbing into such an enclosure is quite risky business when it adjoins a dwelling. If a part of the dwelling could open directly into the apiary, it would be a fine thing on many accounts.

THE VINEYARD APIARY.

Get two posts 6 feet long and three inches square; these must be of some durable wood, white oak for instance. If you can afford the trouble and expense, we really would prefer that you have them planed and painted; at any rate, do not expect your apiary ever to be any thing you may be proud of, if you push down some old sticks temporarily, one longer than the other perhaps, and both askew, for such work soon becomes unattractive and is shunned. Many visitors have admired our apiary, and thought it no wonder we enjoyed bee-keeping in such a place, and these same persons have declared their intention of tipping their poor neglected hives of bees up square and true, removing the weeds, starting grapevines, etc., but alas! their attempts were too often but a couple of sticks picked up hastily as we have mentioned, and a few vigorous strokes in the battle with old dame nature, and then they desisted, before the "coy old lady" had even had time to yield, and bless her devotees with such smiles as only the successful cultivator of the soil knows she can give.

Select the site of your workshop, for such we shall expect it to be, near the center of your plat of ground, and drive these posts or stakes so that they stand east and west, and just three feet from each other, measuring from outside to outside. They are to be driven in the ground so that just four feet is left above, and they must stand plumb and square; if you can't make them true otherwise, get a lever and strong chain and twist them until they are so. Now nail a strip of pine board 1x3 inches and 3 feet long, on the south of both, and just level with the top, from one to the other; just three feet below this, nail a similar one. When the whole is square, true, and plumb, stretch three wires from one strip to the other; these are to be at equal distances from the posts and from each other, and we would then have something like the following figure.

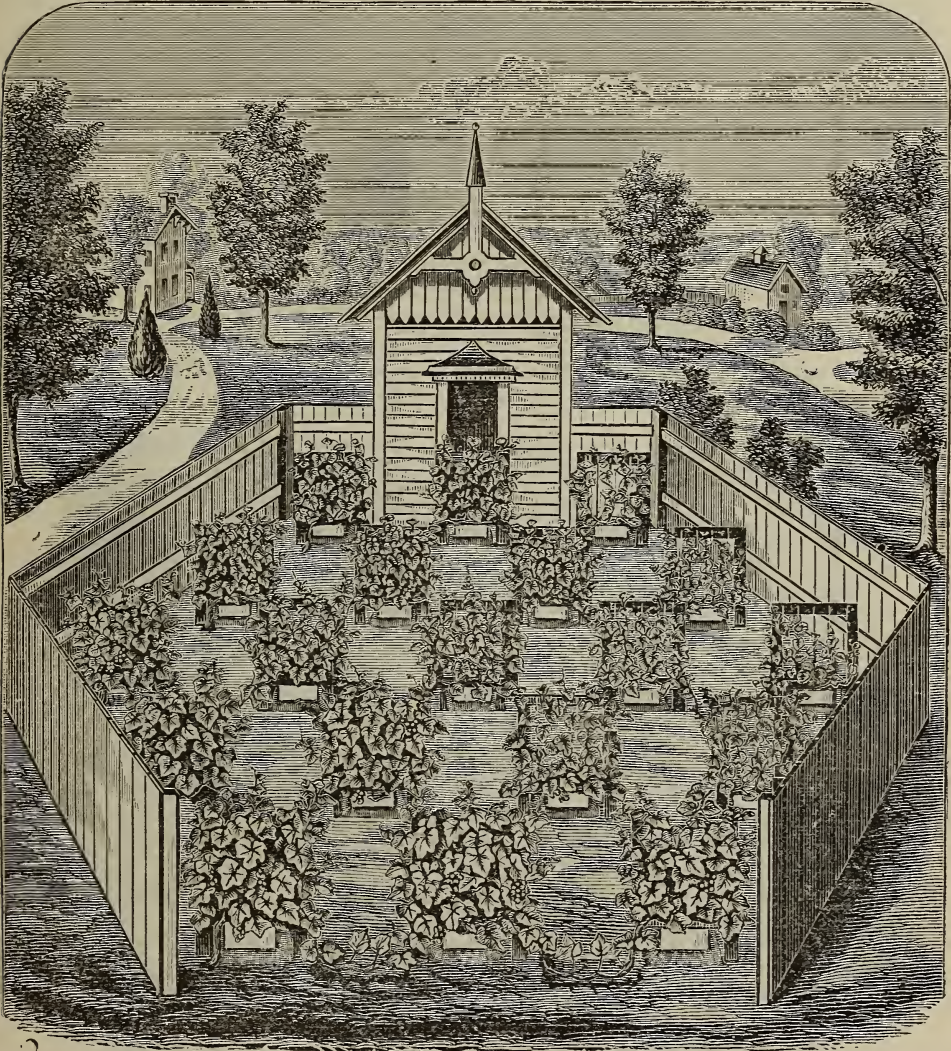
Let A, A, represent the posts, B, B, the 1x3 strips nailed on the south side of the posts, and C, D, E, the wires. These wires should be galvanized iron wire, about No. 16 or 17; larger would be more expensive and no better. Now we are all ready to have a fine thrifty Concord grapevine plant-



ed directly underneath the central wire D. Of course some other grape will do, but we have found none so hardy and thrifty, and that gives us the strong rapid growth that is so desirable for making a shade for our hives, as soon as extreme hot weather comes on. Vines are usually planted only in the spring and fall; but we should have very much more confidence in your success, if we knew you were one of those clever individuals who can plant a vine and make it grow, at *any* season of the year. You can surely do it if you have a mind to. Go to your nearest nursery-man (don't ever buy of peddlers), tell him what you want, and get him to help you take up the vine, roots, dirt and all, soaking the soil with water to make it stick together if need be, while you place the whole in a bushel basket for transportation. Make a large hole beneath your trellis, and lift your vine into it as carefully as you took it up, fill in with good soil, and, after cutting off all the top but one shoot with three or four leaves, treat it just as you would a hill of corn that you wish to do extra well. If the operation is done in hot dry weather, it will probably need watering, and may be shading, until it gets started. We expect you in future to see that no weed or spear of grass is allowed to make its appearance within a yard, at least, of this grape vine. Those accustomed to making rustic work, would doubtless be able to make very pretty trellises at a trifling expense for materials. This vine is to have its one shoot tied to the central wire, D, as fast as it grows, pinching off all side shoots after they

have made one leaf. When it gets to the top of the trellis, pinch it off also, and it will soon throw out side shoots. Pinch all off again except one on each side near the bottom bar B. Train these by tying, straight out horizontally until they reach the posts, then train them up the posts and pinch them off like the middle one. Now get two more

have become strong and vigorous, and not only to have covered the trellis completely, but to have become impatient, seemingly, of being restrained by the continual pinching back necessary to keep it within such narrow limits. Perhaps it has in fact manifested this by blossoming and attempting to bear grapes out of season near the top bar of the



THE VINEYARD APIARY, AND "SWARMING" THE GRAPE-VINES.

shoots to train up the wires, C and E, and we are done. The future treatment of the vines consists only in cutting the upright shoots all back to the horizontal arms tied to the lower bar, B, every winter, training *two* new shoots up each wire and post every summer, and pinching them off whenever they get to the top.

Very well; your one vine is supposed to

trellis. It is precisely like a colony having too many bees for the size of the hive. Very likely, each one of the ten upright canes has produced three or four fine clusters of extra large nice berries, but still the vigor of the vine (if our directions have been carefully complied with) is equal to something more; and, accordingly, we encourage one of the outside canes by allowing it to send a new

shoot up above the rest of the trellis. When this is well started, the whole cane is bent over so as to go straight down to the ground, and then curved outward so as to lie in a trench a few inches deep, that it may be covered with soil enough to protect it from injury.

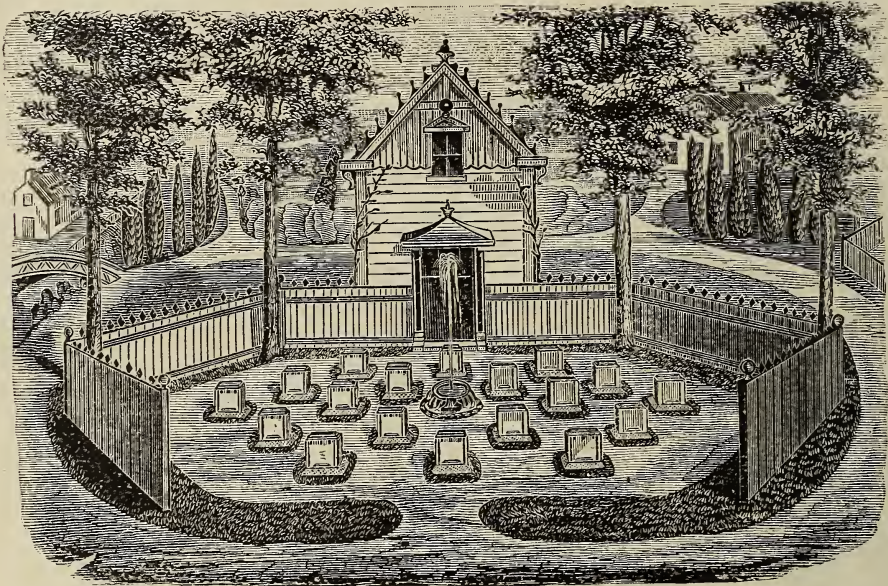
A new trellis is now to be constructed, if it has not been done before, just 4 feet from the old one; that is, the two trellises are to have a walk of just 3 feet in width between them. The new shoot grows very rapidly and can soon be tied up to the first post of the new trellis and across the lower bar. Now select a side shoot for each wire, and almost before you are aware of it, you have another complete grapevine. The engraving will make it all plain.

The view is taken from the south side, and the hives are just visible through the foliage in their proper places. One strong vine will furnish shoots for not only a new one at the right and left, but even for the whole six that are to surround the original

is quite important. This matter we tested by chopping one of the new vines off where it left the old one, as we were hoeing about them. It had been growing with great vigor, and had considerable fruit on it, but the next day the sun hung its foliage like wilted cabbage leaves. By heavy mulching and buckets of water, we induced it to look up again, but it is far behind its comrades, and we have decided not to sever "parental ties" in future at all, and if we are careful in laying them down to tie them close to the posts, they are never in the way.

The idea, that the culture of bees in any way interferes with that of grapes, is a joke entirely outside of our experience. Where grapes are trained thus, fowls, if allowed, will make sad havoc among them; the bees of course then work on the bruised ones, but seldom otherwise.

It may be urged that the above is too much trouble; it is some, but the fine crops of fruit that are almost sure to be secured every season should pay well for it all;



THE LAWN OR CHAFF HIVE APIARY.

one, and in a single season, if need be. As the new vines take root almost as soon as laid down, the old vine suffers but little loss, and we have known new ones, started in this manner the 4th of July, to be well loaded with fine grapes the next season, their connection with the old vine enabling them to become bearing vines in one year only. Although their remaining attached to the old vine does not seem to impair its productiveness, the aid they receive from it

and if you have more than is needed for home use, you will find a ready sale for such grapes at good prices.

LAWN OR CHAFF HIVE APIARY.

With these, we can dispense with the grape vines entirely; as their thick, chaff-packed walls protect them from the sun, as well as from the frosts of winter. Such an apiary may be made very pretty, for it is in reality a miniature city, with its streets and thoroughfares. During the swarming season, it

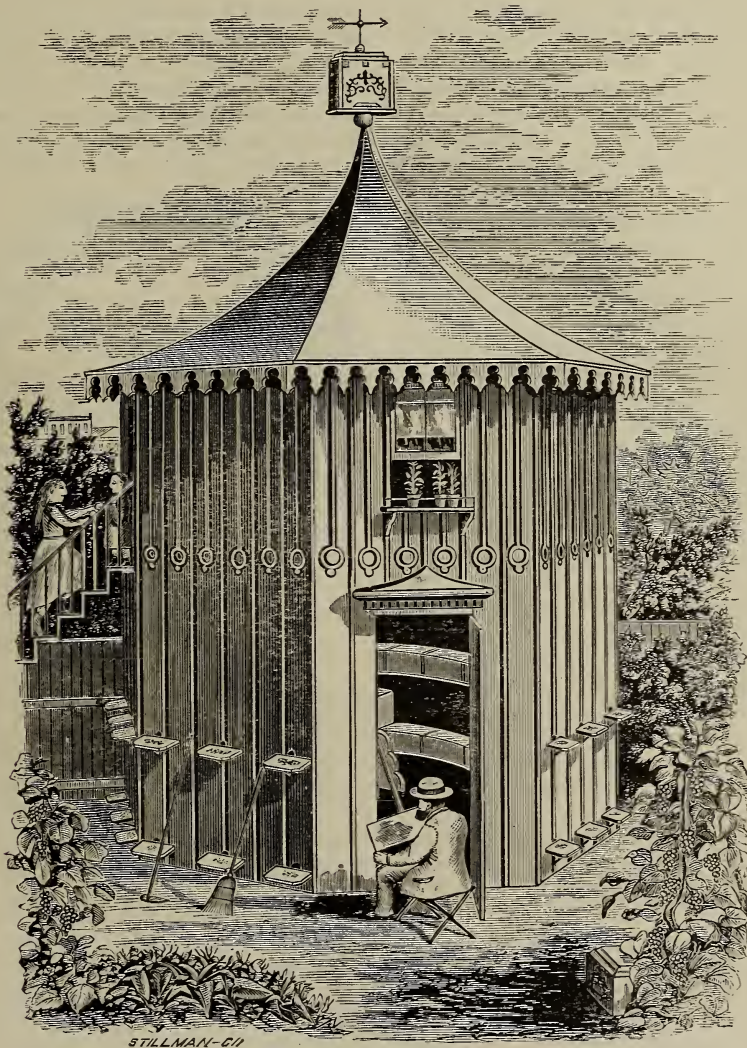
will probably, at times, be quite a busy little city. Some expense and care is avoided by this plan, it is true, but the hives cost considerably more, and are rather unwieldy to handle when bees are to be moved about, sold, etc. The fact that they can be safely wintered on their summer stands, and that very little preparation is needed to enable them to winter safely, is much in their favor.

THE HOUSE APIARY.

This is a very old idea, having been rec-

apiaries are now giving very good results, and with perhaps less labor than when the hives are kept in the open air.

The objections to the house apiary are, first, the expense; especially the *first* expense; for one can make a start in bee culture with a very small amount of capital, with the out-door hives, and the sales of honey and bees will at once furnish all the capital needed, for a moderate yearly increase. With the house, the capital to put up the building



A MODERN HOUSE APIARY.

ommended and used at different times for more than a century past. With the strides that bee culture has been making recently, new reasons have come up for making it desirable that the hives should be housed; and in spite of the difficulties, many house

must be furnished at the outset, and a house for 50 colonies will cost much more than the same number of hives. Most apiarists prefer working in the open air to being cramped up in a building (no matter how large it may be), even at the expense of hav-

ing to perform more labor and take more steps. Secondly, in a building, we are obliged to get all the bees out of a room every time we open a hive, and bees, either dead or alive, are very untidy when crushed by careless footsteps on the floor of a room. To avoid this necessitates an almost incessant use of the broom. Again, when young bees are just sallying out for their first flight, they will, if the hive is opened at just the right time, come out in the house in great numbers, and to try to stop them by any other means than closing the hive, is like trying to stop the rain from falling. These bees, after having had their "play-spell," will insist on returning to the hive in the same way that they came out, and if they are driven out of the house and the door closed, they will sometimes collect in a large cluster on or about the door. It is true they are seldom lost, for they will usually be allowed to enter the hives nearest the door, but it weakens the hive from which they came, and is very apt to puzzle a novice in the business sorely. To obviate this trouble, we can avoid opening the hives during the afternoon, or at such times as the bees are likely to rush out for a play; after a shower for instance.

We give a very accurate picture of the house apiary that we have been using for the past two years, except that the artist has given it a roof rather more fanciful than our own. The interior will be readily understood from the diagram; the upper story is at present occupied by the children as a play room. Perhaps the most difficult part to make in the whole building is the roof, unless we make it of tin; this is somewhat expensive, but if kept well painted, it will last almost indefinitely. The ornamental work is, of course, in no way essential to the success of the establishment pecuniarily.

Many house apiaries are constructed of a square or oblong shape, but our objections to such would be the difficulty of getting the bees out of the corners of the room (this might be obviated by having a square house with the doors at two opposite corners), and the increased danger of having both bees and queen get into the wrong hives. From the engraving of the house apiary, and diagram of the ground plan given below, it will be seen that only 3 hives are on a side. The bees from the central one will of course recognize their own entrance, and those at each side, being the end of the row, will also find theirs without trouble. To make the entrance to each hive

still more conspicuous we take advantage of the battens on the building, as will be seen from the diagram. The building is made of pine or other boards one foot in width, and these boards which are put on up and down, constitute the entire frame of the building. Six of them, put as close together as they will come conveniently, form one of the eight sides, and the cracks are covered with a beveled batten, one edge of the corner boards being beveled slightly, that the batten may close the corner crack also.

A represents one of the heavy outer doors, and B, the light door with glass sash; these doors are the same, on both the east and west sides of the building. G is the shelf that runs entirely around the room, on which the hives are placed. It is about $3\frac{1}{2}$ feet from the floor, and should be about 18 inch-

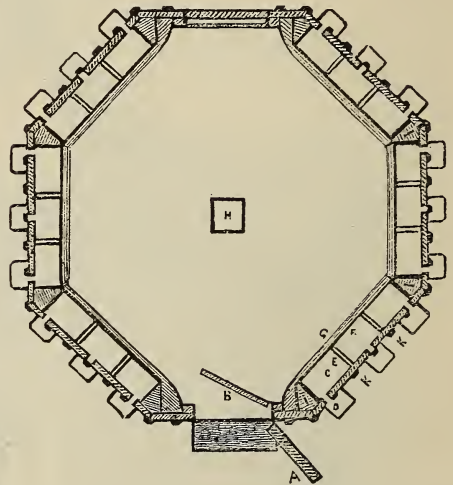


DIAGRAM OF INTERIOR OF HOUSE APIARY.

es wide. The hives are made by a simple division board, E, that holds a pair of metal rabbets on its upper edge, one facing each way; the combs are hung on these, and when all are in place, a sheet of glass, F, bound with tin around its edges, closes the hive by being hung in the rabbets the same as are the frames. The top of the hive is closed by the usual sheet of duck. During winter and spring, the bees are protected by thick chaff cushions laid on the duck sheets. It will be seen that these sheets of glass face the spectator on all sides of the room, and when we can see the bees, during the working season, filling sections and building comb just back of these glass division boards, the effect is more beautiful than can well be imagined. The room should afford as few corners, where stray bees may get a lodging, as possible, and to this end,

we close the triangular corners by bits of board, I, I. They may have a knob on top, and these boxes will then serve for little cupboards, in which to keep various utensils. If the room is open a great deal, the bees are inclined to waste time in buzzing against the glass; therefore it may be well to have a cloth curtain to drop over them, except when we wish to examine the progress of the colony. To prevent the house from becoming damp, we need a ventilator, H, in the centre of the ceiling, about a foot square; we can also have a trap door in the centre of the floor to admit cool air from the cellar, during very hot weather. D is the door step, and the entrances are shown through the walls, just by the battens. It will be observed that the middle hive on each side has its entrance through, or rather under, the batten; this is that the bees may have an additional mark for their own hive, for the entrances (2-inch auger holes) at the sides, are made at the right and left of the battens. The plan seems to work well, for we have lost fewer queens in the house apiary than from any of our out-door hives. The battens are also a shade darker in color, than the rest of the house; thus making them ornamental as well as useful. A light drab is a very pretty color for such a building.

Besides the hives we have just described on the shelf, we have precisely the same arrangement of them on the floor, or if preferred, raised on a platform a couple of inches above the floor. In extracting, we can get along very well with the lower tier, by removing the sheet of glass, and shaking the bees on the floor close to their combs; with the upper ones, we find it best to stand on a chair or box, and shake them on top of the frames close to the wall. If they scatter about, and threaten to run all over the walls and ceiling, take the next hive from the other side, until they get back, assisting them meanwhile with a little smoke. For comb honey, we work just as we do with the out-door hives.

The upper story will be found very convenient for storing various things about the apiary, such as the chaff cushions during the summer, and empty sections and combs during the winter; for we wish to have our lower room, at least, always neat and tidy.

The good and desirable qualities of the house apiary are, first, it is always sheltered and dry, and if the building is kept painted, the hives will always be in good repair;

this is quite an advantage over out-door hives. The hives can be much more quickly opened, as they need no other covering than the chaff cushions in winter, and a single sheet of cloth in summer. Secondly, surplus honey, either extracted or comb, can be removed in much less time, for we have only to remove it and store it in the centre of the room, instead of the laborious carrying that has to be done with out-door hives. Also empty combs, combs filled for destitute colonies, empty frames, frames of section boxes, and, in short, everything needed in working about the hives may be stored in the center of the room, within arms reach of every one of the 36 hives. Furthermore we can handle the bees and do all kinds of work with them during rainy and wet weather when the out-door hives could not be touched.

Nay, further! we can handle the bees by lamplight after the duties of the day are over; we have repeatedly made new colonies thus, to avoid the robber bees that were so annoying in the day time, during a dearth of pasturage. By closing the glass doors, and opening the outer doors, we can work in perfect freedom from robbers at any season of the year. Artificial swarming, queen-rearing, etc., can be carried on very expeditiously, and at a small expense, for the reasons we have mentioned. It has been said that the bees sting worse in the house, than in the open air. This may be the case under some circumstances, but we think not as a general rule. The house gets unpleasantly filled with smoke from the smoker, but it will be but little expense to have a box in which to set the smoker, having a smoke pipe communicating with the open air.

There is still another advantage in the house apiary, and it is perhaps the most important of all. It is that the bees, honey, and all the implements, can be easily kept under lock and key; a very important item where thieving is very prevalent. Where the apiarist becomes the owner of more colonies than can profitably be kept in one place, he can establish house apiaries at almost any point, and I have long had visions of a large central apiary, with 6 house apiaries arranged hexagonally all about it; say three miles from the center, and three miles from each other. I think they could be so managed that a visit once a week during the honey season would, as a general thing, be all that would be needed. Some loss would result from unexpected swarming, but this

could in a great measure be obviated by the use of the extractor, or an abundant supply of sections furnished with the fdn. If located near a dwelling, some of the inmates would soon learn to hive the swarms, and look after things that might turn up. No one should think of undertaking this, until he has the ability of first caring well for *one* apiary; and it can never be made a success, until we have entirely got over all such foolishness as allowing bees to starve, to remain a long time queenless, or to dwindle down from any cause, as too many of us now do.

With a good horse, and a trim light buggy, it would be very pretty work, riding about and overseeing these apiaries; but who among us has the ability to do it successfully? Instead of answering aloud, go to work quietly, and let your works be the answer.

FLOATING APIARY.

This project, we believe, has never as yet been put in practice in our own country. The idea is to have an apiary on a large flat bottomed boat or raft, which is to be floated along on some of our large rivers, so as to be constantly in the midst of the greatest flow of honey almost the season through. It is well known that the white clover commences to bloom first in the extreme south, and then gradually moves northward; if we could be in the midst of this yield during its height, for 3 or 4 months, it would seem enormous crops might be obtained. We are informed by history, that the ancient Egyptians of the Nile made a practical success of these floating apiaries, and that they were warned when it was time to return home, by the depth to which the boat sank in the water, under the weight of the cargo of honey. That the bees might not be lost, the apiary was floated to a new field during the night. Something similar, located on wheels to be drawn by horses, has been suggested, but we believe never attempted.

Since the above was written, Mr. C. O. Perrine, formerly in the honey business in Chicago, has put the project into practice, on a rather large scale. Between four and five hundred colonies were put on a couple of barges, and towed by a steamer up the river from New Orleans. The establishment started out in the spring of 1878, but at the present writing, Sept. 1878, the enterprise can hardly be called a success. In consequence of several accidents, the hives were finally taken from the barges and carried by the steamer until a favorable point was reached, and then set out on the land, like

an ordinary apiary, the process being repeated as often as the forage began to fail. As near as I can gather from newspaper reports, the loss of bees, while flying on the water, was one of the principal drawbacks. Our friend, Perrine, declares it his intention to try again, until all difficulties have been met and overcome, and as he has invested several thousand dollars in the experiment, he has the hearty sympathy of the bee folks of our land. Those interested will find further particulars in the April GLEANINGS, and in the August *Bee Keeper's Magazine*, for 1878.

THE RAILWAY APIARY.

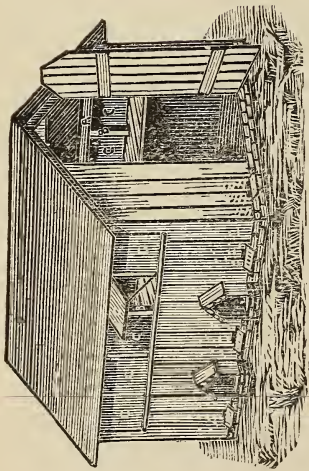
The honey house is placed at the lowest side of the apiary, and a track or tracks with proper switches made to run between each two rows of hives. A barrel is fixed low down in the car, and extractor and implements placed over it. The whole is covered with a light, square tent, made of canvas and wire cloth, for an assistant to work secure from robbers. Roll your car to the top of the slope, hand the full frames from the hive through a slit in the canvas to your assistant until the hive is finished; then roll your car to the next two hives, and so on until you get to the house, when your barrel should be full and ready to roll off for another.

The same arrangement would answer for avoiding the labor of removing comb honey from the hives; and if the bees are wintered in-doors, the hives can be placed on the car, and run directly into the wintering house.

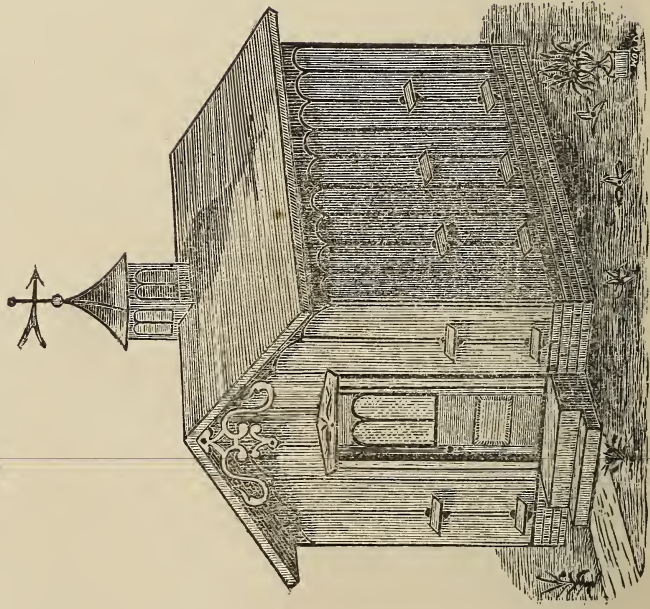
Some experiments have been made with hives permanently located on small low cars, which are to be run into a frost-proof house for wintering, or whenever the weather is such as to make it advisable to house them.

WHICH STYLE OF APIARY TO ADOPT.

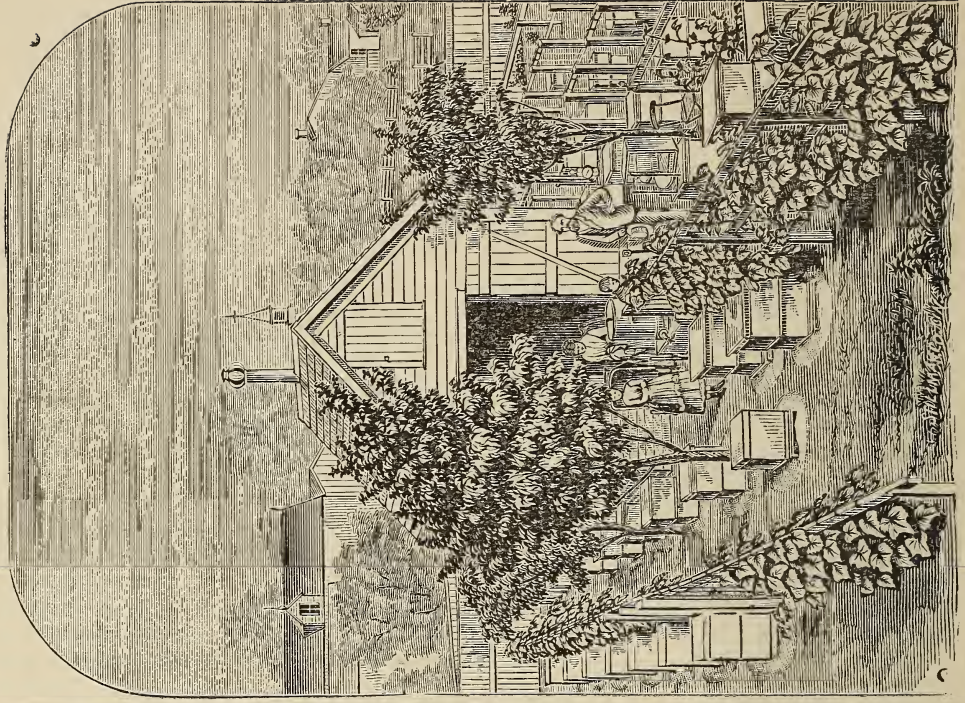
By way of summing up, I will state that with my present experience I would choose the Chaff hive apiary, for honey alone. For raising bees and queens for sale, I would use the vineyard apiary and Simplicity hives, lifting the bees into Chaff hives to winter. If I were in a neighborhood where honey and bees were very likely to be stolen, or if I were going to locate an apiary away from home, I would choose the house apiary. Objections to the latter are, the inconvenience of handling hives that you can not walk all around, and the expense of the building. For general purposes, I would use a vineyard apiary, with both Simplicity and Chaff hives.



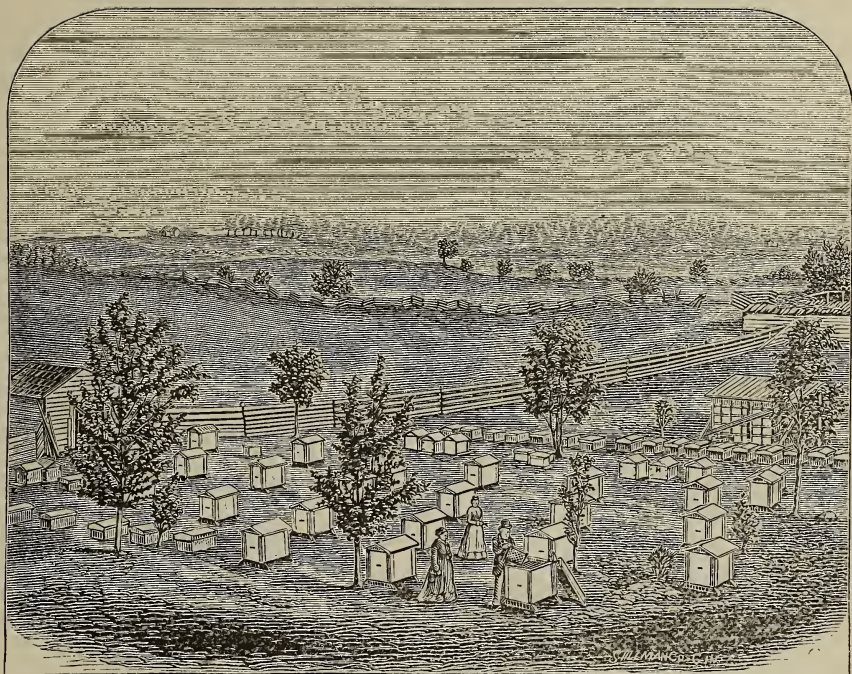
OLIVER FOSTER'S 14-HIVE HOUSE APIARY.



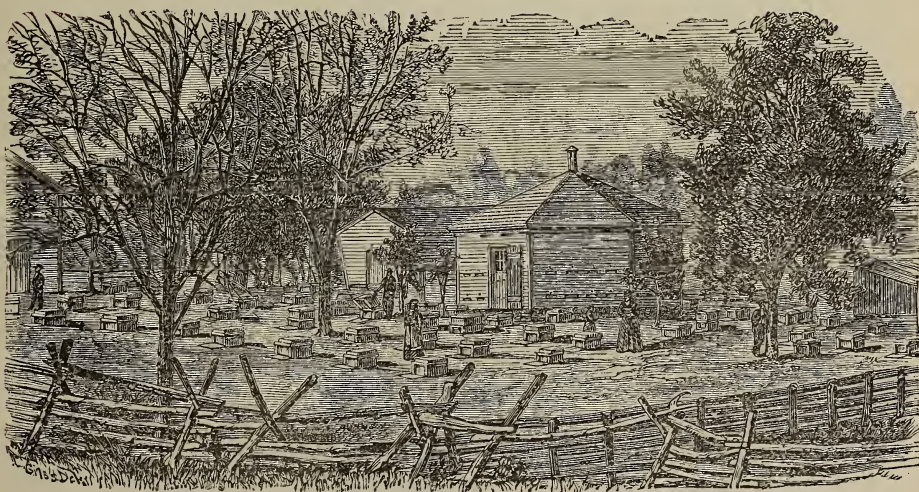
A HOUSE APIARY FOR 20 HIVES.



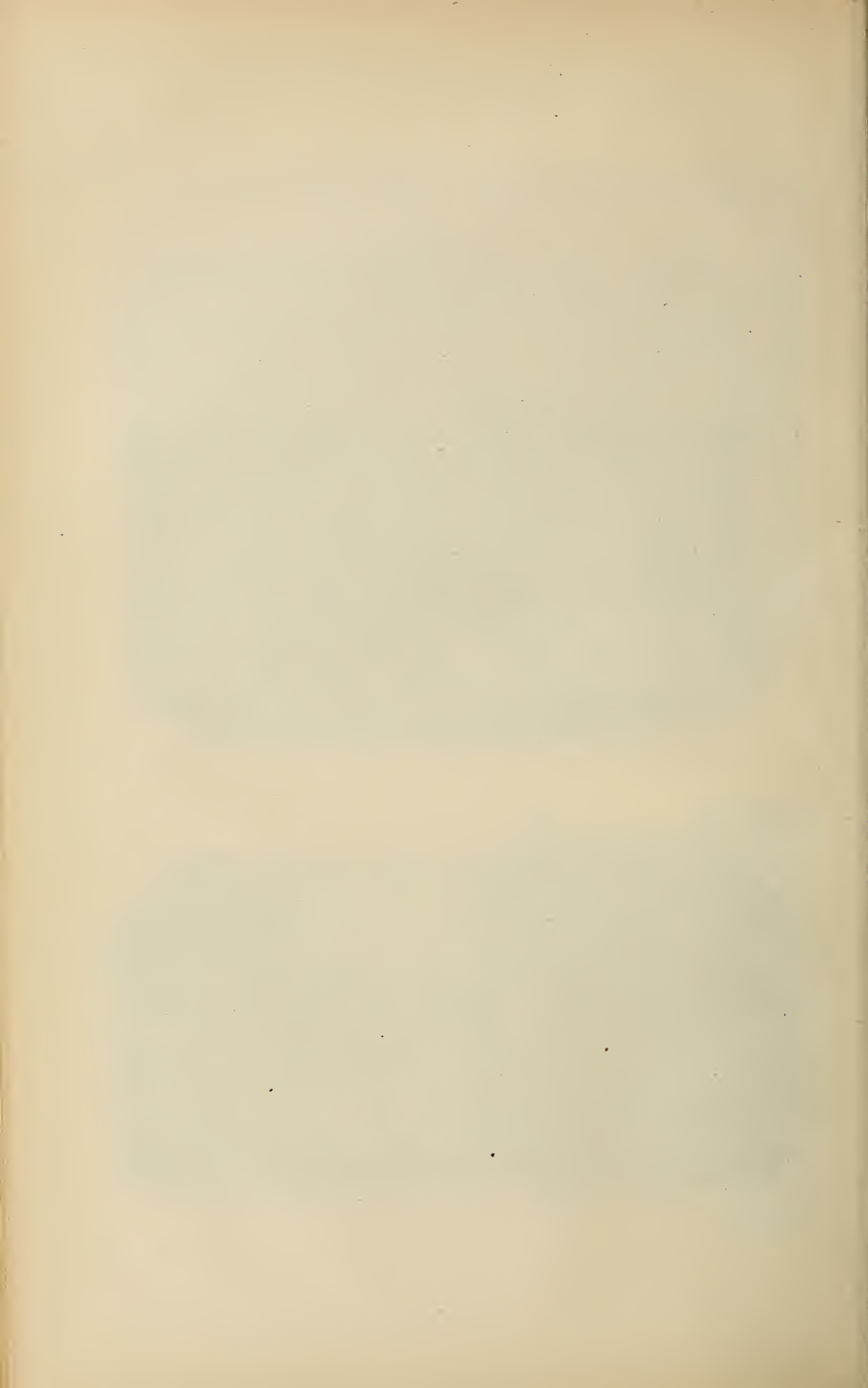
A PART OF OUR OWN ORIGINAL HEXAGONAL APIARY.



J. H. TOWNLEY'S CHAFF HIVE APIARY, TOMPKINS, JACKSON CO., MICH.



A. A. RICE'S APIARY, INCLUDING HOUSE APIARY, SEVILLE, OHIO.



APHIDES. It is with that class of these insects that produce honey (or, rather, a sweetish substance that bees collect and store as honey), that we have to do. They are a kind of plant lice, and are to be seen in almost all localities, and during nearly all the summer and fall months, if we only keep our eyes about us, and notice them when they are right before us. If you examine the leaves of almost any green tree, you will find them peopled by small insects, almost the color of the leaves on which they live; while some are quite large, others are almost or quite invisible to the naked eye. Now all these bits of animated nature, while they feed on the green foliage, are almost incessantly emitting a sort of liquid excrement; and as this is usually thrown some distance from the insect, it often falls from the leaves of the tree, like dew. If this matter is new to you, I would ask you to examine the stone pavements early in the morning, under almost any green tree: an apple or willow will be pretty sure to show spots of moisture, something as if water or rain had been sprinkled over it in a fine spray. The leaves of the trees will also be found somewhat sticky where the exudation is sufficient to make it noticeable.

This substance is, I believe, not always sweet to the taste, but usually so. The quantity is often so small, as to be unnoticed by the bees, but occasionally, they will seem quite busy licking it up. I have several times found them at work on the leaves of our apple trees very early in the morning, but never to such an extent that it might really be called honey dew. I have seen them also on a willow fence, making it hum like a buckwheat field, and at the same time, the ground under the trees looked as if molasses had been sprinkled about. The bees were at work on the ground also; the honey tasted much like cheap molasses. The strange part of the matter was that this occurred during a warm day late in the month of Oct.; it proceeded entirely from the aphides, for they literally covered the leaves of the willow, and could be plainly seen ejecting the sweet liquid, while they fed on the leaves. This was plainly the cause of the honey dew in this case, but it is by no means clear, that such is always the case. See HONEY DEW.

ARTIFICIAL COMB. Although several attempts have been made to produce comb for the bees of full depth of cell, we believe all have resulted in failures; the bees either leave them untouched, or gnaw

them down, and build their own in place. If given the base of the cell, however, with only shallow walls of such depth that the bees can reach to the bases with their mandibles so as to shape and thin the bottom as they wish before the walls are raised, the case is quite different; for they are used then as readily perhaps as their own natural comb, as has been abundantly proven by the COMB FOUNDATION, which see.

ARTIFICIAL FERTILIZATION. Much time and money has been expended in wire cloth houses, and glass fixtures, to accomplish this result, the more perhaps because a few sanguine individuals imagined they had succeeded in having the queens meet the drones in confinement, thus securing the advantage of choice drones, as well as queens, to rear stock from.* A friend of mine was quite sure he succeeded, but after examining into the matter, it was found that the queens got out and took their flight in the usual way through the passage that was left for the worker bees; he having based his calculations on the oft repeated statement that a queen could not pass through a passage 5-32 of an inch in width. The queen just before her flight is very slender, and will get through a passage that an ordinary laying queen would not, and those who claimed to have succeeded, being rather careless observers, might have supposed that the fertilization had in reality taken place in the hive. Again, one of those who claimed to have succeeded states that a queen will always take exercise in the open air, after she has been fertilized in confinement; this seems to render the whole matter ridiculous, especially if she takes this flight before she commences to lay. About the year 1870, hundreds of bee-keepers were busily at work, trying this project with a view of keeping the Italian blood in a state of absolute purity, in neighborhoods where black or common bees were kept in considerable numbers; and the subject affords a fair illustration of the mischief which may be done by careless or unscrupulous persons, in reporting through the press, what has been guessed at rather than demonstrated by careful experiment.

Taking into view the in-and-in breeding that would have resulted had the experiments really been a success, it is doubtful if it would have been a benefit after all. When it was found that the Italians speedi-

* Since the above was written the matter has been revived, and an account of at least a partial success, is given in the *American Bee Journal* for Nov., of 1878.

ly became hybrids where so many black bees were all about us, as a matter of necessity frequent importations from Italy began to be made; and when it was discovered that stock fresh from their native home at once showed themselves superior as honey gatherers, the business assumed considerable proportions, and now almost every apiarist of 50 hives, has an imported queen of his own to rear queens from. This has the effect of not only giving us the best stock known, but of giving frequent fresh strains of blood, and is perhaps very much better all around, than it would have been had artificial fertilization been a success.

ARTIFICIAL HEAT. As strong colonies early in the season are the ones that get the honey and furnish the early swarms as well, and are in fact the real source of profit to the bee-keeper, it is not to be wondered at that much time and money has been spent in devising ways and means whereby all might be brought up to the desired strength in time for the first yield of clover honey. As market gardeners and others hasten the early vegetables by artificial heat, or by taking advantage of the sun's rays by means of green houses, &c., it would seem that something of the kind might be done with bees; in fact we have, by the aid of glass and the heat of a stove, succeeded in rearing young bees every month in the year, even while the weather was at zero or lower outside; but so far as we can learn, all artificial work of this kind has resulted in failure, so far as profit is concerned. The bees, it is true, learned to fly under the glass and come back to their hives, but for every bee that was raised in confinement, two or three were sure to die, from one cause or another, and we at length decided it was best to wait for summer weather, and then take full advantage of it.

Later, we made experiments with artificial heat while the bees were allowed to fly out at pleasure, and although it seemed at first to have just the desired effect, so far as hastening brood rearing was concerned, the result was, in the end, just about as before; more bees were hatched, but the unseasonable activity or something else killed off twice as many as were reared, and the stocks that were let alone in the good old way came out ahead. Since then we have rather endeavored to check very early brood rearing, and, we believe, with better results.

A few experiments with artificial heat have apparently succeeded, and it may be that it will eventually be made a success;

but our impression is, that we had much better turn our energies to something else, until we have settled warm weather. Packing the hives with chaff, sawdust, or any other warm, dry, porous material, so as to economize the natural heat of the cluster, seems to answer the purpose much better, and such treatment seems to have none of the objectionable features that working with artificial heat does. The chaff needs to be as close to the bees as possible; and to this end, we would have all the combs removed except such as are needed to hold their stores. Bees thus prepared seem to escape all the ill effects of frosty nights in the early part of the season, and we accomplish for brood-rearing, exactly what was hoped for by the use of artificial heat.

For the benefit of those who may be inclined to experiment, I would state that I covered almost our entire apiary with manure, on the plan of a hot bed, one spring, and had the satisfaction of seeing almost all die of spring dwindling. At another time, I kept the house apiary warmed up to a summer temperature with a large oil lamp, for several weeks, just to have them beat those out of doors. The investment resulted in losing nearly all in the house apiary with spring dwindling, while those outside stayed in their hives as honest bees should, until settled warm weather, and then did finely, just because I was "too busy to take care of them" (?), as I then used to express it. After you have had experience enough to count your profitable colonies by the hundred, and your crops of honey by the ton, it will do very well to experiment with green houses and cold frames; but beginners had better let such appliances alone unless they have plenty of money to spare for more bees.

ARTIFICIAL PASTURAGE. Although there is quite a trade springing up in seeds and plants to be cultivated for their honey alone, and although we have about 4000 young basswood trees of our own, growing finely and promising to be the basis of a honey farm at some future time, yet we can at present give little encouragement to those who expect to realize money by such investments. There is certainly a much greater need of taking care of the honey that is almost constantly wasting just for lack of bees to gather it. A field of buckwheat will perhaps occasionally yield enough honey to pay the expense of sowing, as it comes in at a time when the bees in many places would get little else; and if it does not pay in honey, it certainly will in grain.

If one has the money, and can afford to run the risk of a failure, it is a fine thing to make some accurate experiments, and it may be that a farm of one or two hundred acres, judiciously stocked with honey bearing plants, trees, and grains, would be a success financially. It has been much talked about, but none so far as we know, have ever put the idea in practice. To beginners we would say: plant and sow all you can that will be sure to pay aside from the honey crop, and then, if *that* is a success, you will be so much ahead; but beware of investing much in seeds that are for plants producing nothing of value except honey. Alsike, and white Dutch clover, buckwheat, rape, mustard, and the like, it will do to invest in; but catnip, mignonnette, Rocky mountain bee plant, etc., etc., we would at present handle rather sparingly. It should be borne in mind that we can hardly test a plant, unless we have one or more *acres* of it in bloom, and that small patches do little more than to demonstrate that the blossoms contain some honey, giving us very little clue to either quantity or quality. Bees will work on blossoms, and at times with great apparent industry, when they are obliged to make hundreds of visits and consume hours of time, in getting a single load; we therefore should be intimately acquainted with the interior of the hive, as well as the source from which the bees are obtaining the honey, before we can decide what is profitable to sow as a honey plant.

By way of encouragement, we may say that both plants and trees under thorough cultivation, yield honey in much larger quantities than those growing wild, or without attention. Our basswoods that have commenced to blossom, have shown a larger amount of honey in the nectaries, than we ever saw in any that grew in the woods or fields. The question, "How many acres of a good honey-bearing plant would be needed to keep 100 colonies busy?" has often been asked. If ten acres of buckwheat would answer while in full bloom, we should need perhaps ten other similar fields sown with rape, mustard, catnip, etc., blossoming at as many different periods, to keep them going the entire warm season. It would seem 200 acres should do nicely, even if nothing were obtained from other sources, but at present we can only conjecture. A colony of bees will frequently pay for themselves in ten days during a good yield from natural pasturage, and if we could keep up this state of affairs during the whole of the summer months, it would be quite an item indeed.

Buckwheat, rape, and alsike clover, are the only cultivated plants that have given paying crops of honey, without question, so far as we have been informed. See FIGWORT, AND SPIDER FLOWER.

ARTIFICIAL SWARMING. To attempt to give all the various plans and modifications that are recommended and practiced successfully, would make a book of itself; we shall therefore only give those we think safest and simplest.

If you are a new hand with bees, you had better not undertake to do such work, until you find that bees are swarming naturally in the neighborhood. At such a time, you will probably succeed by almost any plan. If you have plenty of money and not much time, you had better buy your queens, and the dollar queens will do very well; if you should get them killed, it will be no serious loss. If you also have plenty of empty combs, you can make an artificial swarm in a very few minutes, by simply moving any strong colony several rods away, and placing a new hive filled with empty comb (or better, with one frame of hatching brood), in its place. That the returning bees may not kill the strange queen they find in place of their accustomed mother bee, we protect her for a day or two in a cage. See CAGES FOR QUEENS. As they enter with their loads of pollen and honey, they seem very much perplexed and astonished, scramble out of the hive, and after a few turns about the premises to reassure themselves, they go in again, repeating this until too tired, apparently, to bother their little heads any farther with a matter that is altogether beyond their comprehension, and wisely concluding that "what can't be cured, must be endured," unload in the empty combs near the queen, and go after more spoils. We have had a colony of this description bring in over 20 lbs. of honey, during the first two days. Let the queen out after they get friendly to her—see INTRODUCTION OF QUEENS—and your work is done. Should the colony get weak before the young bees begin to hatch out, give them a comb of hatching brood from some strong stock. This plan is only for the swarming season.

COMBS OF HATCHING BROOD.

As these combs of hatching brood are a very important item in building up, or strengthening stocks, and as we shall have need of referring to them often, we will explain that you are to look over the combs of a very populous colony and select one that has bees just gnawing through the caps of the cells. At the proper season, you

should find combs that will hatch out a dozen bees while you are holding them in your hand; it should contain little or no unsealed brood, for the new colony might not be able to feed all the larvæ. One L. frame, if full of capped brood, will make a very fair swarm of bees; and as these newly hatched downy bees—like newly hatched chickens for all the world—are ready to take up with anybody or anything, we can put them safely anywhere without fear of their being hostile, to either queens or workers.

Can we not get along without the empty comb by using foundation in its stead? Yes we can, but it is hardly advisable, unless we can have two or three old combs to start with, or a *full* hive of bees.

If you prefer to rear your own queens, which every apiarist should do, move your colony as before, but instead of the queen, give them a frame of *eggs* from your choicest queen. Now if you want fine queens, equally as good as those reared in natural swarming, be sure you do not give them any large larvæ, with the eggs. The best and safest way is to get an empty comb, place it in the centre of your colony containing your imported or choice queen, and leave it there until you find eggs in it that are just hatching into larvæ; these larvæ will be scarcely visible to the naked eye when first hatched, but in place of the egg, you will see a tiny spot of the milky food that the nurse bees place round the embryo bee. This is just the age you wish the larvæ for queen rearing, and you may take the frame, bees and all, if you are sure you are not carrying your old queen along—look sharp—to your new hive. If you want as many queen cells as you can get, it will be a good idea to cut an oblong piece out of the comb, just under the eggs and larvæ. If it is inconvenient to move your hive (as in the house apiary) you can take only the combs with adhering bees, and in fact you need take only so many of the combs as are necessary to get all the brood and the queen.

In 12 days after the eggs are given the bees, the queens may some of them hatch; therefore, if you design saving the extra queens, you will need to remove all the cells but one, or the first-hatched queen will destroy them all.¹⁰ We have had a young queen destroy as many as twenty fine cells in a single day, when we were so careless as to delay attending to them just at the right time. About 10 days after the queen hatches, you may expect her to begin to lay, and then you are as far along, as when you purchase a

laying queen to start with, except that your bees have been growing old all the time—see AGE OF BEES—and unless they are supplied with fresh eggs or brood, will be pretty weak, before any young bees will be hatched to take their place. Now if you wish to have matters progress lively, you can give these bees a comb containing eggs every two or three days during the whole time they are waiting for the queen to be hatched and fertilized; they will do much better if they are thus employed, and they will be quite a prosperous colony by the time the queen is ready to lay. To get these eggs, you have only to insert an empty comb in the centre of a populous colony until the queen has deposited as many eggs in the cells as are required.

So far, all is very simple. To swarm a large apiary, and at the same time Italianize all our new stocks, we would only have to repeat the process as many times as we have colonies. But how about the surplus queen cells that we cut out? This is just where the complication comes in; yet if we look into the matter very carefully, we think it will be found quite simple. These queen cells if cut out shortly before hatching and inserted into the combs of any queenless colony, will usually furnish them a queen as soon as the one left where it was built; and if an artificial colony was made at the time the cells were cut out, it is plain we should have them supplied about ten days earlier than the one that was obliged to start their cells from the egg. Bees usually seem to have a preference for building their own cells, instead of having them furnished, but as they can by no possibility get a queen hatched in less than ten days—perhaps nine in extreme cases—the queen from the inserted cell will be out and destroy the others almost as soon as they are started, and so we need be to no trouble to get all the undesirable brood out of the way, as in our first experiment. Unfortunately, there is an *if* in the matter, and it is, if the bees do not destroy this cell you have given them, and proceed to raise one of their own in the good old way. Many contrivances have been invented to prevent them, such as caging the cell, etc., but we think you will do well to waste no time in experimenting with such machinery. The lamp nursery enables us to hatch almost any number of queen cells, with safety, but occasionally the queens are lost in introducing even then; see LAMP NURSERY.

The plan we would recommend for begin-

ners, and perhaps for everybody else as well, is to procure as many combs of hatching brood from different hives as you have queen cells and to insert a cell in each; the manner of inserting the cells, will be found in **QUEEN REARING**. These combs are to be all put in the one hive in which the cells were built, and if you have more than ten cells, put on an upper story, or even a third. As there are no bees in the hive except those that built the cells and the young ones just hatching, we shall have no cells torn down, and in a few hours, they will have waxed them all firmly in their places.

Now with these combs of hatching brood, every one containing a cell nearly ready to hatch, we are in excellent trim to go on with artificial swarming. We can not only remove hives and put empty ones in their places as in our first experiment, but we can take combs of bees and brood from any hive in the apiary, blacks, hybrids, or anything and put them into a new hive located any where, put one of the frames with the queen cell among them, and presto! we have a good colony, requiring no more care whatever. Four combs of bees and brood, will make a good colony at any time of the year, and they will be at work like an old colony in ten days. We have never known a cell destroyed when given to an artificial swarm in the manner we have stated. In substituting a new hive for an old one, we should, if possible, use a new hive precisely like the old one, or much trouble may be found in getting the bees to go into it. If we cannot do this, make it look at least like the old one.

EMPTY COMBS FOR ARTIFICIAL SWARMING.

These will almost always be on hand in swarming time, but if not, a frame containing a sheet of fdn. may be put in place of any comb taken from a strong colony. The fdn. is fully as good as the natural comb, and, in some respects, even better. If you have no fdn., let the bees build combs, one at a time, in new frames, watching them to see that they do not build drone comb. If they will not build worker comb, contract the space with a division board, and have the combs built in weaker colonies. Using frames of fdn. is, however, far the better way. During fruit blossoms, and long before swarming time, an ample supply of beautiful combs may be secured, built out from fdn.

Caution:—The foregoing directions are given generally for making artificial swarms during the swarming season, or, at least, at a time when honey is coming in abundant-

ly. It will require more skill and more care to make artificial swarms in the fall, or at any time when the bees are disposed to rob, and if a hive is moved away, as directed, the new one must always have a comb containing unsealed brood, as well as the empty combs, or the bees will not be certain to defend their hive against robbers. See **QUEEN REARING**.

ASTERS. Under this head, we have a large class of autumn flowers, most of which are honey bearing; they may be distinguished from the helianthus, or artichoke and sunflower family, by the color of the ray flowers. The ray flowers are the outer, colored leaves of the flower, which stand out like rays; in fact, the word aster means star, because these ray flowers stand out like the rays of a star. Many of the yellow autumn flowers are called asters, but this is an error; for the asters are never yellow, except in the center. The outside, or rays, are blue, purple, or white. You may frequently find half a dozen different varieties growing almost side by side. Where there are acres of them, so to speak, they sometimes yield considerable honey, but some seasons they seem to be unnoticed by the bees. I do not think it will pay to attempt to cultivate them for honey; better move your bees to where they grow naturally, when you have determined by moving a single hive first, as a test, whether they are yielding honey in paying quantities.



ASTER.

Where the asters and golden rod abound largely, it may be best to defer feeding until these plants have ceased to yield honey; say the last of September.



FRANK BENTON'S APIARY, LARNACA, ISLAND OF CYPRUS, MEDITERRANEAN SEA.

B.

BARRELS. I would hardly advise using barrels for comb honey, although it is done to some extent I believe, in districts where the old style of keeping bees in log gums prevails; but for liquid honey, we shall probably never find a cheaper receptacle that will stand the rough usage of shipping honey, as well. It is true, we can put our honey in tin cans, but these are more expensive—the very cheapest costing at least one cent for every pound of honey they will contain—and they cannot be shipped *safely*, without first being crated. Besides all this, a barrel of honey will be received at a much lower rate of freight, than any other kind of package it is possible to make. If we are then all decided as to the expediency of storing our honey in barrels, we wish to decide upon the most profitable size for these barrels. The regular size of about 31 or 32 gallons is probably the cheapest size, but it has been objected to on account of the difficulty of handling so great a weight as 350 to 400 lbs., which the barrel and all would weigh. This however is no great objection to one who knows how to “take the advantage” of a barrel, as my father used to express it to “us boys,” when we were loading stone, and as economy of money as well as “traps,” is quite an item where we have tons of honey, I think we had better have large barrels principally. For the accommodation of customers who want a smaller quantity, it may be well to have some half barrels also, but these will cost considerably more, in proportion to the amount of honey they hold. Some very neat small ones, holding about 140 lbs, cost about \$1.75 each; this would be at the rate of 1¼c. per lb. Our large barrels cost us \$2.25, and hold about 350 lbs; this is less than ¾c. per lb. for the package. From this it appears that we shall have to charge a little more for honey put up in half barrel packages.

LEAKY BARRELS.

I hope you will feel as I do about it, that it is bad enough to talk about having honey

leak all round, without having any practical experience in the matter; and I am very glad to be able to tell you how to entirely avoid it. It may be well to remark that honey has a funny way of expanding during the candying process—it will generally candy as soon as the weather gets cold—and if your barrels or cans do not give it room to expand, it will be pretty sure to push out the corks or bungs. Some kinds of honey expand more than others, and under some circumstances, perfectly ripened honey will scarcely candy at all. If the barrels are left not quite full, and then filled up completely when ready to ship, there will be very little trouble.

We prefer barrels made of sound oak, but I presume those made of other strong wood will answer, if carefully waxed as we shall direct. The hoops should be of strong hoop iron, for honey is very heavy compared with most other liquids, and we wish them to stand safely the rough handling they are likely to receive on the cars, even if they should be sent back and forth several times. The hoops should be secured by large tacks, if they show any tendency to slip. If you have had the barrels made for your own use and intend them to be returned when you sell honey, it is a very good idea to have them neatly painted. This will keep the hoops in place, and will preserve the barrels very materially. There is one objection to this, however, and that is you are many times under the necessity of waiting for your barrels to be emptied, and then they are likely to be forgotten. We once waited 2 years for we had some sent away with honey, and then succeeded in getting the pay for them instead of the barrels, after much importunity.

WAXING THE BARRELS TO PREVENT LEAKING.

A good barrel, carefully made of well seasoned timber, *should not* leak, without any waxing; but as they often do, we think it safest to have them all waxed. This is sim-

ply coating the entire inside with wax or paraffine. The latter we consider better, as well as cheaper. Wax is worth from 25 to 30c. per lb, but the paraffine can be had for 25c. As the latter melts at a lower temperature, and is more limpid when melted, a much less quantity is needed to coat the inside thoroughly and fill all cracks and interstices, and less skill and expedition is needed in its manipulation. You should have about a gallon of the melted liquid, for a small quantity will not keep hot until you can pour out the remainder after the waxing is done, and too much of it will adhere to the inside of the barrel. Ten or 12 lbs. will do very well. Have your bungs nicely fitted, and a good hammer in readiness to get the bung out quickly. With a large-mouthed tunnel, pour in the hot liquid, and bung it up at once. Now roll the barrel so as to have the wax go entirely round it, then twirl it on each head, and give it another spinning so as to cover perfectly all round the chime. This operation will have warmed the air inside to such an extent, that the liquid will be forced into every crevice, and if there is a poor spot, you will hear the air hissing, as it forces the liquid through it. Just as quickly as you get the inside covered, loosen the bung with your hammer, and if your work is well done, the bung will be thrown into the air with a report. Pour out the remaining liquid, warm it up, and go on with the rest. If the weather is cool, you had better put your barrel in the sun, turning it frequently and driving down the hoops, before you pour in the wax. This is to save your material, for if the barrel is cold, it will take a much heavier coating; and the main thing is simply to close all crevices. For honey in quantities of less than 100 lbs., perhaps tin cans will be handier than barrels or kegs, for they can then be shipped short distances as freight, without crating.

Good thick honey will usually become solid at the approach of frosty weather, and perhaps the readiest means of getting it out of the barrel in such cases, is to remove one of the heads, and take it out with a scoop. If it is quite hard, you may at first think it quite difficult to get a scoop down into it; but if you press steadily, and keep moving the scoop slightly, you will soon get down its whole depth. If the barrel is kept for some time near the stove, or in a very warm room, the honey will become liquid enough to be drawn out through a large sized honey gate. After the head of a barrel has been taken out, the barrel should be waxed again

before using, around the head that has been removed. Get out all the honey you can, by warming and allowing it to drain, and then with a tea-kettle of warm water, clean off every particle of honey. The rinsings may be saved and fed to the bees that there be no waste. As barrels are apt to get musty, or give the honey a taste, I would advise washing and lightly coating them every season, before being used again. After having been once coated, a very small quantity of paraffine will answer perfectly, the second time. I should have no hesitation in using any kind of a barrel for honey, if it were first scalded, allowed to dry thoroughly, and then perfectly coated with paraffine. If the barrel is dry and warm, or slightly hot, there will never be any danger of its cleaving from the wood, as wax sometimes does. Paraffine has neither taste nor smell, and does not decay as wax does, when exposed to dampness or the action of liquids.

Caution:—A mixture of wax and rosin was at one time used for coating barrels, and after giving it, as I thought, a thorough test, I used it for a whole crop of honey. The result was that the honey tasted of rosin after being in the barrels over winter, and it was sold at 10c, when it would otherwise have brought 15c. This is quite a serious matter, as some of the Journals seem to be still recommending the rosin.

BASSWOOD. With perhaps the single exception of white clover, the basswood, or linden as it is often called, furnishes more honey than any other one plant or tree known. It is true, that it does not yield honey every season, but what plant or tree does? It occasionally gives us such an immense flood of honey, that we can afford to wait a season or two if need be, rather than depend on sources that yield more regularly, yet in much smaller amounts. If a bee-keeper is content to wait—say ten or fifteen years for the realization of his hopes, or if he has an interest in providing for the bee-keepers of a future generation, it will pay him to plant basswoods. A tree that was set out just about 10 years ago, on one of our streets, now furnishes a profusion of blossoms, almost every year, and from the way the bees work on them, I should judge it furnished considerable honey. A hundred such trees in the vicinity of an apiary, would be, without doubt, of great value. See **ARTIFICIAL PASTURAGE**. Our 4000 trees were planted in the spring of 1872, and are now—1877—many of them bearing fair loads of blossoms. We made some experiments with

basswood seeds, but they proved mostly failures, as have nearly all similar ones we have heard from. By far the best and cheapest way is to get small trees from the forest. These can be obtained in almost any quantity, from any piece of woodland from which stock have been excluded. Cattle feed upon the young basswoods with great avidity, and pasturing our woodlands is eventually going to cut short the young growth of these trees from our forests, as well as of many others that are valuable. We planted trees all the way from one to ten feet in height. The larger ones have as a general rule done best.



AMERICAN LINDEN OR BASSWOOD.¹³

(*Tilia Americana*.)

The above will enable any one to at once distinguish the basswood when seen. The clusters of little balls with their peculiar leaf attached to the seed stems, are to be seen hanging from the branches the greater part of the summer, and the appearance, both before and after blossoming, is pretty much the same. The blossoms are small, of a light

yellow color and rather pretty; the honey is secreted in the inner side of the thick fleshy petals. When it is profuse, it will sparkle like dewdrops, as shown at A, if a cluster of blossoms is held up to the sunlight.

Basswood and perhaps most other forest trees require shade, especially when young; and much to our surprise, some that were planted directly under some large white oak trees, have done better than any of the rest. Who has not noticed exceedingly thrifty basswoods growing in the midst of a clump of briars and bushes of all sorts? I would place the trees not more than 12 feet apart, for it is an easy matter to thin them out whenever they are found too close. A neighbor has planted basswoods entirely round his farm on the road sides, and they add much to the comfort of travellers, are pretty to the sight, and, without doubt, will furnish honey enough, in time, to pay all expenses.

The best yield of honey we have ever had from a single hive, in one day, was from the basswood bloom; the amount was 43 lbs. in three days.¹³ The best we ever recorded from clover, was 10 lbs. in one day. The honey from the basswood has a strong, aromatic or mint flavor, and we can tell when the blossoms are out, by the perfume about the hives. The taste of the honey also indicates to the apiarist the very day the bees commence work on it. The honey, if extracted before it is sealed over, when it is coming in rapidly, has the distinctive flavor so strong as to be very disagreeable to some persons. My wife likens it to the smell and taste of turpentine or camphor, and very much dislikes it, when just gathered, but when sealed over and fully ripened in the hive, she thinks it delicious, as does almost every person.

BEE-BREAD. A term in common use, applied to pollen when stored in the combs. In olden times, when bees were killed with sulphur to get at the honey, more or less pollen was usually found mixed with the honey; it has something of a "breadly" taste, and hence, probably, has its name. Since the advent of the extractor, and section boxes, it is very rare to find pollen in the honey designed for table use. See POLLEN.

BEE-DRESS. Before the advent of the Italians, and the convenient smokers we now have, it was thought best to have a dress, or sort of "jacket," attached to the veil, with sleeves for the protection of the operator, while working among the hives.

Such things are now, I believe, almost out of date, with the exception of veils, and the gloves that are used to some extent. The veils, without doubt, are often useful; but I am so well satisfied that even a beginner will get along better and with less stings, with his bare hands than with any kind of gloves, that I have no hesitation in advising him to have nothing to do with them. Have your smoker in good trim, and there is hardly a necessity of your being stung at all. While I cannot think it best to advise a dress particularly for bee work, I feel that it is a very wise precaution to have your ordinary attire of such a nature that bees may not get under the clothing; many severe stings are received in this way, from bees having no ill will at all, but only stinging because pressed by the clothing. When bees are shaken or dropped off the combs, they are very apt to crawl up ones feet, and I know of few things more annoying, than the sensation of a bee crawling up ones leg when he is too busy to stop and stamp until it drops out of its unpleasant (to all parties concerned) lodging place, or stings and has it done with, as he is pretty sure to do if you are not careful. If you wear flannels, and have them tucked inside your stockings, this cannot happen; or if you wear boots and have your pants tucked in your boot tops, you are bee proof in this respect. I prefer low shoes in the summer, and light clothing for out door work, and when I am going to shake bees off the frames, I always put my pant legs inside my stockings, even at the risk of being stared at by visitors. If you are obliged to handle bees in cool weather, or so late in the day that they have ceased flying, they are very apt to crawl under your coat or vest, and sometimes up your sleeves. I do not mind the stings so much as the time it takes to get them out; and I dislike to run any risk of carrying them into the presence of others, who may not be so indifferent to stings as I am. Some years ago, I wore shirts that buttoned up in front, and the hybrids seemed especially fond of getting inside my shirt whenever I particularly desired them outside. I am not partial to new fashions in clothing, and when my wife made a shirt that buttoned down the back, she rather expected a sermon on the folly of—well, she heard in place of objections, a declaration that I would never wear any other, because they were bee-proof. For the same reason, I prefer the sleeves close at the wrist, and my whole clothing, in general, so close and free from openings that a bee can

crawl up my shoes, and go clear to the top of my head and fly off, without any trouble to either himself or myself, on the principle of, "Live and let live."

When at work among the hives, if bees are scattered about on the ground, I am always careful about stepping on them, or so near that they may crawl up my person; and nothing makes me more nervous than to have visitors who will walk right among them with their careless feet, crushing them into the dust. If it were right to return evil for evil, I should sometimes think it was good enough for them, if they did get a sting or two. The natural home of the honey bee is the forest, and if they consent to take up their abode on the ground at our very doors, we certainly should forbear stepping on them when we pay them a visit.

I have said nothing about the attire of ladies who work in the apiary, but I presume I have given them a sufficient idea of what is needed, to enable them to so arrange their clothing as to avoid stings as much as possible. When bees are coming in heavily laden, we should all have respect enough for them, to avoid standing in front of their hives, or walking very near to their entrances. If they are scattered about on the ground, step around them, and there will be very little danger of the stings that we often hear of, because a bee becomes accidentally entangled in the clothing. See **VEILS**.

BEE HUNTING. I have warned you so often, my friends, against leaving sweets of any kind about the apiary, and about being careful not to let the bees get to robbing each other, that it may seem a little queer, to be directed how best to encourage and develop this very robbing propensity, in these little friends of ours.

The only season in which we can trap bees is when they will rob briskly, at home; for when honey is to be found in the flowers in plenty, they will hardly deign to notice our bait of even honey in the comb. Before starting out, it will be policy to inform yourself of all the bees kept in the vicinity, for you might otherwise waste much time in following lines that lead into the hives of your neighbors. You should be at least a mile from any one who has a hive of bees when you commence operations, and it were safer to be two miles. I do not mean by this, to say that there are no bee trees near large apiaries, for a number have been found within a half mile of our own, and an experienced hand would have but little trouble in finding more, in all probability; but those

who are just learning, would be very likely to get very much perplexed and bothered by domesticated bees mixing with the wild ones.

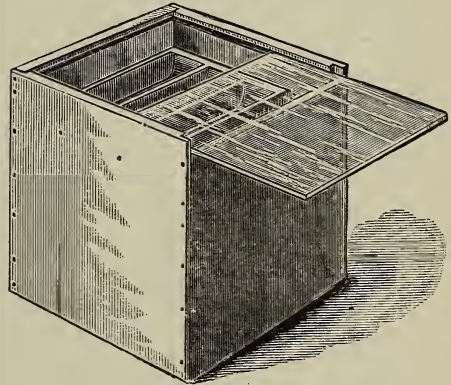
Perhaps the readiest means of getting a line started, is to catch the bees that will be found on the flowers, especially in the early part of the day. Get them to take a sip of the honey you have brought for the purpose, and they will, true to their instinctive love of gain, speed themselves home with their load, soon to return for another. To find the tree, you have only to watch and see where they go. Very simple, is it not? It certainly is on paper, but it usually involves a deal of hard work, when carried out in practice. You can get along with very simple implements, but if your time is valuable, it may pay to go out fully equipped. For instance, a small glass tumbler will answer to catch bees with, and after you have caught one, you can set the glass over a piece of honey comb. Now cover it with your handkerchief to stop his buzzing against the glass, and he will soon discover the honey, and "load up." Keep your eye on him, and as soon as he is really at work at the honey, gently raise the glass and creep away, where you may get a good view of proceedings. As soon as he takes wing, he will circle about the honey, as a young bee does in front of the hive, that he may know the spot when he comes back; for a whole "chunk" of honey, during the dry autumn days, is quite a little gold mine in his estimation. There may be a thousand or more hungry mouths to feed, away out in the forest in his leafy home, for aught we know.

If you are quick enough to keep track of his eccentric circles and oscillations, you will see that his circles become larger and larger, and that each time he comes round, he sways to one side; that is, instead of making the honey the centre of his circles, he makes it almost on one edge, so that the last few times he comes round he simply comes back after he has started home, and throws a loop, as it were, about the honey to make sure of it for the last time. Now you can be pretty sure which way his home lies almost the very first circuit he makes, for he has his home in mind all the time, and bears more and more toward it.

If you can keep your eye on him, until he finally takes the "bee line" for home, you do pretty well, for a new hand can seldom do this. After he is out of sight, you have only to wait until he comes back, which he surely will do, if honey is scarce. Of course, if his

home is near by, he will get back soon; and to determine how far it is, by the length of time he is gone, brings in another very important point. The honey the bees get from the flowers, is very thin honey; in fact, rather nearer sweetened water, than honey, and if we wish a bee to load up and fly at about a natural "gait," we should give him honey diluted with water to about this consistency. Unless you do, he will not only take a great deal more time in loading up, but the thick honey is so much heavier, he will very likely stagger under the load, and make a very crooked bee line of his homeward path. Besides, he will take much more time to unload. Sometimes, after circling about quite a time, he will stop to take breath before going home, which is apt to mislead the hunter, unless he is experienced; all this is avoided by filling your honey comb with honey and water, instead of the honey as we usually find it.

Now it takes quite a little time, to get a bee caught and started in the work, and that we may be busy, we will have several bees started at the same time; and to do this expeditiously, we will use a bee hunting box made as in the following cut.



BOX FOR BEE HUNTING.

This is simply a light box about $4\frac{1}{2}$ inches square; the bottom is left open, and the top is closed with a sheet of glass that slides easily in saw cuts made near the upper edge. About a half inch below the glass, is a small feeder, quite similar to the one figured in FEEDING AND FEEDERS.

HOW TO USE THE HUNTING BOX.

Take with your box, about a pint of diluted honey in a bottle. If you fill the bottle half full of thick honey, and then fill it up with warm water, you will have it about right. In the fall of the year, you will be more likely to find bees on the flowers, in the early part of the day. When you get on the ground,

near some forest, where you suspect the presence of wild bees, pour a little of your honey into the feeder, and cautiously set the box over the first bee you find upon the flowers. As soon as the box is well over the flower, close the bottom with your hand, and he will soon buzz up against the glass. Catch as many as you wish, in the same way, and they will soon be sipping the honey. Before any have filled themselves, ready to fly, set your box on some elevated point, such as the top of a stump in an open space in the field, and draw back the glass slide. Stoop down now, and be ready to keep your eye on him, whichever way he may turn. If you keep your head low, you will be more likely to have the sky as a background. If you fail in following one, you must try the next, and as soon as you get a sure line on one, as he bears finally for home, be sure to mark it by some object that you can remember. If you are curious to know how long they are gone, you can, with some white paint in a little vial and a pencil brush, mark one of them on the back. This is quite a help where you have two or more lines working from the same bait. When a bee comes back, you will recognize him by the peculiar inquiring hum, like robbers in front of a hive where they have once had a taste of spoils. If the tree is near by, each one will bring others along in his wake, and soon your box will be humming with a throng so eager, that a further filling of the feeder from the bottle will be needed. As soon as you are pretty well satisfied in which direction they are located, you can close the glass slide and move along on the line, near to the woods. Open the box, and you will soon have them just as busy, again; mark the line, and move again, and you will very soon follow them to their home. To aid you in deciding just where they are, you can move off to one side and start a cross line. Of course the tree will be found just where these lines meet; when you get about where you think they should be, examine the trees carefully, especially all the knot holes, or any place that might allow bees to enter and find a cavity. If you place yourself so that the bees will be between you and the sun, you can see them plainly, even if they are among the highest branches. Remember you are to make a careful and minute examination of every tree, little and big, body and limbs, even if it does make your neck ache. It is a good thing to look up once in a while, just as it is a good thing to go out into the woods, and get a view of outside things

generally, now and then. If you do not find them by carefully looking the trees over, go back and get your hunting box, bring it up to the spot, and give them "feed" until you get a quart or more at work. You can then see pretty clearly where they go. If you do not find them the first day, you can readily start them again almost any time, for they are very quick to start, when they have once been at work, even though it is several days afterward.

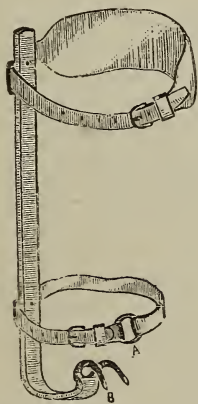
Bees are sometimes started by burning what is called a "smudge." Get some old bits of comb containing bee bread as well as honey, and burn them on a small tin plate, by setting it over a little fire. The bees will be attracted by the odor of the burning honey and comb, and if near, will sometimes come in great numbers. Oil of anise is sometimes used, to attract them by its strong odor. We have had the best success in getting them from the flowers as we have directed.

A spy glass is very convenient in finding where the bees go in, especially if the tree is very tall; even the toy spy-glasses sold for 50c. or a dollar, are sometimes quite a help. The most serviceable, however, are the achromatic glasses that cost about \$3.00. The very best thing for the purpose is an Opera glass such as can be purchased for about \$5.00. With these we can use both eyes, and the field is so broad that no time is lost in getting the glass instantly on the spot. We can, in fact, see bees with them in the tops of the tallest trees, almost as clearly as we can see them going into hives placed on the ground. They can also be used to follow a bee on the wing, as he leaves the hunting box. If one's time is valuable, an opera glass will be a very good investment.

After you have found the tree, I presume you will be in a hurry to get the bees that you know are there, and the honey that *may* be there. Do not fix your expectations too high, for you may not get a single pound of the latter. Of two trees that we have recently taken, one contained just about as much honey as we had fed them, and the other contained not one visible cell full! The former were fair hybrids, and the latter well marked Italians. If the tree is not a valuable one, and stands where timber is cheap and plenty, perhaps the easiest way may be to cut it down. This may result in a mashed up heap of ruins, with combs, honey, and bees all mixed up with dirt and rubbish, or it may fall so as to strike on the limbs or small trees, and thus ease its fall in such a way as to do very little injury to the hive of the

forest. The chances are rather in favor of the former, and on many accounts it is safer to climb the tree and let the bee hive down with a rope. If the hollow is in the body of the tree or so situated that it cannot be cut off above and below, the combs may be taken out and let down in a pail or basket; for the brood combs, and such as contain but little honey, the basket will be rather preferable. The first thing, however, will be to climb the tree, and as I should be very sorry to give any advice in my A B C book that might in any way lead to loss of life, I will, at the outset, ask you not to attempt climbing, unless you are, or can be, a very careful person. An old gentleman who has just been out with us remarked that he once knew a very expert climber who took all the bees out of the trees for miles around, but was finally killed instantly, by letting his hands slip, as he was getting above a large knot in the tree. We do not wish to run any risks, where human life is at stake.

For climbing large trees, a pair of climbers are used, such as is shown in the following cut.



CLIMBERS FOR BEE HUNTERS.

The iron part is made of a bar 18 inches long, $\frac{3}{4}$ wide by $\frac{1}{2}$ thick. At the lower end, it is bent to accommodate the foot as shown, and the spurs are made of the best steel, carefully and safely welded on. These points should be sharp, and somewhat chisel shaped, that they may be struck safely into the wood of the tree; the straps will be readily understood by inspection. When in use, the ring, A, is slipped over the spur, B, and the straps are both buckled up safely. If the tree is very large, the climber provides himself with a tough withe or whip, of some tough green bough, and bends this so it will go around the trunk, while an end is held in either hand. As he climbs upward, this is

hitched up the trunk. If he keeps a sure and firm hold on this whip, and strikes his feet into the trunk firmly, he can go up the most forbidding trees, rapidly and safely. A light line, a clothes line for instance, should be tied around his waist, that he may draw up such tools as he may need. The tools needed, are a sharp ax, hatchet, saw, and an auger to bore in to see how far the hollow extends. If the bees are to be saved, the limb or tree should be cut off above the hollow, and allowed to fall. A stout rope may be then tied about the log hive, passed over some limb above, the end brought down and wrapped about a tree until the hive is cut off ready to lower. When it is down, let it stand an hour or two, or until sundown, when all the bees will have found and entered the hive. Cover the entrance with wire cloth, and take it home.

If you want only the honey, and do not care for the bees, you can slab off one side of the hollow, cut out the combs, and let them down in pails. The bees can very often be saved in this way, as well as the former. Fix the brood combs about the right distance apart, in a pail or basket; the bees will in time collect about them, and may then, toward dark, be carried safely home. Many bee hunters brimstone the bees, but I am so averse to any such method of killing bees, that I have not even the patience to describe it. Sometimes the hollow is below the limbs; in this case, the climber passes a surcingle about him, under his arms, around the tree, and in this position chops the bees out. I have said nothing about smoke or veils, for so far as my experience goes, none seem to be needed. The bees become so frightened by the chopping, that they are perfectly conquered and cease entirely, to act on the offensive. It may be well to have some smoking rotten wood near, and a bellows smoker would be very convenient to drive the bees out of the way, many times.

After you have got them down where the combs can be reached, the usual directions for transferring are to be followed. A bee-keeper who has a taste for rustic work, might set the log up in his apiary, just to show the contrast between the old style of bee-keeping and the new. Some very interesting facts are to be picked up in bee hunting. One of the trees we cut recently contained comb as much as a yard long, and not more than 8 inches wide in the widest part. It has been said that bees in a state of nature select cavities best adapted to their needs. I am inclined to think this very poor

reasoning. If a farmer allowed nature to take care of his corn fields, he would get a very poor crop, and from what I have seen of bee trees, I should judge the poor fellows need to be taken care of, almost as much as the corn. We frequently get 100 lbs. of comb from a hive but I never knew a bee tree to give any such amount, as the product of a single season. We sometimes find quite a quantity of honey in a tree, it is true, but it is usually old honey, and often the accumulation of several years.

There are more bees in the woods than we perhaps have any idea of, especially, in the neighborhood of considerable apiaries. In one of my first trials at bee hunting I started a fine line, directly toward the woods, but I looked in vain for bees, after going into them, and finally gave it up. A few days afterward, I got an old hand at the business to hunt them up for me, and he almost at once pointed out a tree plainly visible from where they were baited, standing in the open lot. As the tree contained very thick old honey, it had probably stood there unnoticed for years, and yet it was in plain sight. The same hunter, very soon found another, but a little distance from this one. And within a few days, we have found two more in that same locality. Since these two have been carried away and domesticated in our apiary, we find the Italians apparently just as thick on the wild flowers as they were before, indicating that there are more trees in the same vicinity.

DOES BEE HUNTING PAY?

If you can earn a dollar per day at some steady employment, I do not think it would, as a rule; but there are doubtless localities where an expert would make it pay well, in the fall of the year. With the facilities we now have for rearing bees, a bee-keeper would stock an apiary much quicker by rearing the bees, than he would by bringing them home from the woods, and transferring. In the former case he would have nice straight combs, especially if he used the *fdn.*, but the combs from the woods, would require a great amount of fussing with, and they would never be nearly as nice as those built on the *fdn.*, even then. So much by way of discouragement. On the other hand, a ramble in the woods, such as bee hunting furnishes, is one of the most healthful forms of recreation that I know of; and it gives one a chance to study, not only the habits of the bees, but the flowers as well, for in hunting for a bee to start with, we find many plants that are curious

and many that we would not otherwise know they frequented. In our recent trips, we were astonished to find the Simpson honey plant, of which so much has been said in our Journals recently, growing in our own neighborhood, and we saw the bees drinking the sweet water out of the little hollow balls, or rather pitcher shaped blossoms. Again, climbing and taking the bees out of one of the monarchs of the forest, is really one of the fine arts, if done safely; and I feel like taking off my hat in deference to the one who does the work nicely, something as I would to a renowned doctor or lawyer, or an expert mechanic.

NEVER QUARREL ABOUT BEE TREES.

When you have found your tree, go at once to the owner of the land, and get permission to take your bees. No matter what the law allows, do nothing in his absence you would not do if he were standing by, and do your work with as clear a conscience as you would work in your own bee yard. Many quarrels and disagreements and much hard feeling, have been engendered by cutting bee trees. If I am correctly informed, bees are the property of whoever finds them first; and on this account it is customary to cut the initials of the finder, with the date, in the body of the tree; but you have no more right to cut the owner's timber without permission than you have to cut his corn. I have never found any one inclined to be at all difficult, when they were politely *asked* for permission to get our bees out of the trees. I do not wonder that people feel cross when their timber is mutilated by roving idlers, and I can scarcely blame them for giving a wholesome lesson now and then just to remind us that we have laws in our country for their protection. I hope my readers will have no disposition to trespass on the premises or rights of any one, without permission. The most difficult and particular person in your neighborhood, will, in all probability, be found pleasant and accommodating, if you go to him in a pleasant and neighborly way.

BEE-MOTH. It is very likely that the moth worm is, as has been so often stated, the worst enemy the honey bee has—if we except ignorant bee-keepers—but if such is the case, we can consider ourselves very fortunate, for the moth is almost no enemy at all, to one who is well posted, and up with the times. When you hear a person complaining that the moth worm killed his bees, you can set him down at once, as knowing very little about bees; and if a

hive is offered you, that has an attachment or trap to catch or kill moths, you can set the vender down as a vagabond and swindler. You can scarcely plead ignorance for *him*, for a man who will take upon himself the responsibility of introducing hives, without knowing something of our modern books and bee journals, should receive treatment sufficiently rough to send him home, or into some business he understands.

When a colony gets weakened so much that it can not cover and protect its combs, robbers and moth-worms help themselves as a natural consequence, but either rarely do any harm if there is plenty of bees, and a clean tight hive. If a hive is so made that there are crevices which will admit a worm, and not allow a bee to go after him, it may make some trouble in almost any colony; and I can not remember that I ever saw a patented moth-proof hive that was not much worse in this respect than a plain simple box hive. A plain simple box is in fact all we want for a hive; but as we must have the combs removable, we must have frames to hold them; and if these frames are made so that bees can get all round and about them, we have done all we can to make a moth proof hive.

Of course, colonies will at times get weakened; and with the best of care, with the common bees especially, worms will sometimes be found in the combs. Now if you have the simple hive I shall recommend, you can very quickly take out the combs, and with the point of your knife, remove every web and worm, scrape off the debris, and assist the bees very much. If there is an accumulation of filth on the bottom board, lift out all the combs, and brush it all off, and be sure you crush all the worms in this filth for they will crawl right back into the hive, if carelessly thrown on the ground.

If you keep only Italians, or even all hybrids, you may go over a hundred colonies and not find a single trace of a moth worm. At the very low price at which Italian queens are now to be purchased, it would seem that we are very soon to forget that a bee-moth ever existed, and the readiest way I know of to get combs that are badly infested, free from worms, is to hang them, one at a time, in the centre of a full hive of Italians. You will find all the webs and worms strewn around the entrance of the hive, in a couple of hours, and the comb cleaned up nicer than you could do it, if you were to sit down all day to the task.

HOW TO KEEP EMPTY COMBS SECURE FROM THE MOTH WORMS.

If you have Italians only, you may have no trouble at all, without using any precaution; but if there are black bees around you, kept in the old fashioned way, or in "patent hives," you will be very apt to have trouble, unless you "look out." Suppose, for instance, you take a comb away from the bees during the summer months, and leave it in your honey house several days; if the weather is warm, you may find it literally infested with small worms, and in a few days more, the comb will be entirely destroyed. Combs partly filled with pollen seem to be the especial preference of these greedy, filthy looking pests, and I have sometimes thought they would do but little harm, were it not for the pollen they find to feed on. A few years ago, we used to have the same trouble with comb honey when taken from the hive during the early part of the season; but of late we have had less and less of it and the present season—1877—I have scarcely seen a moth worm in our comb honey at all, and we have not once fumigated our honey house. I ascribe it to the increase of the Italians, in our own apiary, and those all about us, for the greater part of the bees in the woods are now partly Italian. These have driven the moth before them to such an extent that they bid fair to soon become extinct. Perhaps much has been also done, by keeping all bits of comb out of their way; no rubbish that would harbor them has been allowed to accumulate about the apiary, and as soon as any filth has been found containing them, it has been promptly burned. Those who take comb honey from hives of common bees are almost sure to find live worms in them, sooner or later.

How do the worms get into a box of honey that is pasted up tightly, just as soon as the bees are driven out? I presume they get in just as they get into the comb taken from a hive during warm weather. The moth has doubtless been all through the hive, for she can go where a bee can, and has laid the eggs in every comb, trusting to the young worms to evade the bees by some means after they are hatched. This explanation, I am well aware, seems rather unreasonable, but it is the only one I can give. In looking over hives of common bees, I have often seen moths dart like lightning from crevices, and have sometimes seen them dart among the bees and out again, but whether they can deposit an egg so quickly as this, I am unable to say. In taking combs from the hive

containing queen cells to be used in the lamp nursery, I have always had more or less trouble with these moth worms. The high temperature, and absence of bees, are very favorable to their hatching and growth, and after about 3 days, the worms are invariably found spinning their webs. If they are promptly picked out, for about a week, no more make their appearance, showing clearly that the eggs were deposited in the combs, while in the hive.

When the queen cells are nearly ready to hatch, I often hear the queens gnawing out, by holding the comb close to my ear; by the same means, I hear moth worms eating out their galleries along the comb, and more than once, I have mistaken them for queens. They are voracious eaters, and the "chanking" they make, when at full work, reminds one of a lot of hogs. As they are easily frightened, you must lift the comb with great care, to either see or hear them at their work.

Their silken galleries are often constructed right through a comb of sealed brood, and they then make murderous work with the unhatched bees. Perhaps a single worm will mutilate a score of bees, before he is dislodged. These are found generally at the entrance of the hive in the morning, and numerous letters have been received from new beginners, asking why their bees should tear the unhatched brood out of the combs, and carry it out of the hives. I presume the moth is at the bottom of all, or nearly all, of these complaints. If you examine the capped brood carefully, you will see light streaks across the combs where these silken galleries are, and a pin, or knife point, will quickly pry his wormship out of his retreat. As the young worms travel very rapidly, it is quite likely the eggs may have been deposited on the frame or edges of the comb. It is a little more difficult to understand how they get into a honey box with only a small opening, but I think it is done by the moth, while on the hive.

You may perhaps have noticed that the moth webs are usually seen from one comb to another, and they seldom do very much mischief, unless there are two or more combs side by side. Well, if you, in putting your surplus combs away for winter, place them 2 or more inches apart, you will seldom have any trouble, even should you leave them undisturbed until the next July. There is no danger from worms, in any case, in the fall, winter or spring, for the worms cannot develop, unless they have a summer temper-

ature, although they will live a long time in a dormant state if not killed by severe freezing weather. I have kept combs in my barn two years or more; but they were not removed from the hives until fall, and were kept during the summer months, in a close box, where no moth could possibly get at them. I have several times had worms get among them when I was so careless as to leave them exposed during warm weather, and one season, I found nearly 1000 combs so badly infested that they would have been almost worthless, in less than a week. The combs were all hung up in the honey house, and then about a lb. of brimstone was thrown on a shovel of coals in an old kettle. This was placed in the room, and all doors and windows carefully closed. Next morning, I found most of the worms dead, but a few that were encased in heavy webs were still alive; after another and more severe fumigation, not a live one was to be found, and my combs were saved. I have several times since, fumigated honey in boxes in the same way.

After the bees have died in a hive, it should never be left exposed to robbers and moths, but should be carried in-doors at once, or carefully closed up. If you have not bees either by artificial or natural swarming, to use the combs before warm weather, you should keep a careful watch over them, for a great amount of mischief may be done in a very few days. I once removed some combs, heavy with honey, in August, and thinking no worms would get into them so late, I delayed looking at them. A month later, the honey began to run out on the floor, and upon attempting to lift out a comb, it was found impossible to do so. When all were lifted up at once, a mass of webs nearly as large as one's head was found, in place of the honey and combs. So much for not keeping a careful watch of such property.

By way of summing up, I would say: Use plain, simple, unpatented hives, get Italians as soon as you can, keep your colonies strong, be sure that none of them by any means become queenless, and you need have no solicitude in regard to the bee-moth among your bees. If you have spare combs, or comb honey that has been taken away from the bees in warm weather, keep an eye on it, and either destroy the worms as soon as they appear, or fumigate them as I have directed. When your eye has become trained, you will detect the very first appearance of a worm, by its excrement, in the shape of a

fine white powder. We sometimes hunt them out thus and destroy them, when they are so small as to be only just visible to the naked eye. Giving your combs a good freeze, say a temperature of 15 or 20°, will answer the same purpose as the fumigation.

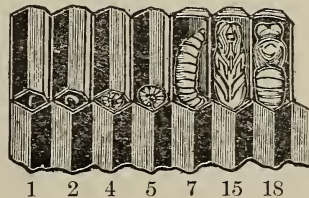
BEES. Everybody knows what bees are, I suppose, and therefore I need not attempt to give you a picture of them. If you contemplate becoming a bee-keeper, I would advise you to get a hive of them, and then to use your own eyes and ears, to see if what I tell you about them is true. At present we have but two varieties of bees that are in common use for the production of honey, and with the vast difference in favor of the Italians, we shall very soon have only the Italians. The Egyptians have been tried in our country to some extent, but are I believe inferior to the Italians, besides being much more vindictive. Bees from the island of Cyprus and from the Holy-Land, are mentioned in connection with ITALIAN BEES, which see. Albino bees have also been talked about, but after testing them in my own apiary, I find them little different from the common Italians. The fringe or down that appears on the rings of the abdomen of young bees is a trifle whiter than usual, but no one would observe it unless his attention was called to it. The queens are very yellow, but the workers, as honey gatherers, are decidedly inferior, even to the second generation; and when we select light colored bees or queens for several successive generations, if we are not careful, we shall have a worker progeny lacking as honey gatherers, and in ability to endure. By selection, we can get almost any thing we want, and that quite speedily with bees, for we can produce several generations in a single season, if need be.

It is said in the South, that they have two varieties of the common or black bee, but it is quite likely they are one and the same thing, for bees in the same neighborhood vary much in color; the bees of one colony may be almost a brown, while in another they are almost black. I shall speak, in this book, of but two kinds, the black or common and the Italian.

HOW BEES GROW.

During warm weather, while your bees are gathering honey, open your hive in the middle of the day, and put in the center a frame containing a sheet of fdn; examine it every night, morning and noon, until you see eggs in the cells. If you put it between two combs containing brood, you will very

likely find eggs in the cells the next day. If you have never seen an egg that is to produce a bee, you may have to look very sharp the first time, for they are white like polished ivory, and scarcely larger than one of the periods in this print. They will be seen in the center of the cell attached to the comb by one end. As soon as you discover eggs mark down the date. If the weather is favorable, these eggs will hatch out in about 3 days or a little more, and in place of the egg, you will, if you look sharp enough, see a tiny white worm or grub floating in a minute drop of milky fluid. If you watch the bees, you will find them incessantly poking their heads into these cells, and it is likely that the milky fluid is placed on and about the egg, a little before the inmate breaks its way out of the shell. I infer this, because I have never been able to get the eggs to hatch, when taken away from the bees, although I have carefully kept the temperature at the same point as in the hive. These worms are really the young bee, in its larval state, and we shall in future call them larvæ. They thrive and grow very rapidly, on their bread-and-milk diet, as you will see if you look at them often. They will more than double in size in a single half-day, and in the short space of 7 days, they will have grown from a mere speck to the size of a full-grown bee, or so as to completely fill the cell. This seems almost incredible, but there they are, right before your eyes. I presume it is owing to the highly concentrated nature of this same "bread and milk" food that the workers are so constantly giving them, that they grow so rapidly. If you take the comb away from the bees for a little while, you will see the larvæ opening their mouths to be fed, like a nest of young birds, for all the world.



FROM THE EGG TO THE BEE.

The figures underneath are intended to represent the age in days. First is the larva just as it has broken the egg-shell on the third day; next, the larva two days old. During the fourth and fifth days, they grow very rapidly, but it is difficult to fix any precise mark in regard to the size. On the seventh day the larva has straightened himself

out, and the worker bees have capped him over. I have made a pretty accurate experiment on this point, and it was just six days and seven hours after the first egg hatched, when they got it completely capped over. Just when they begin to have legs and eyes, I do not know; but I have found that the wings are about the last part of the work. We are all of us too ignorant, by far, on this matter, and I suggest that we set to work and investigate the matter thoroughly. The eggs of the common fowl have been broken, and drawings made of the embryo, every day from the 1st to the 21st. Can we not do as much for the science of apiculture?

After the larvæ are 7 days old, or between 10 and 11 days from the time when the egg was laid, you will find the bees sealing up some of the largest. This sealing is done with a sort of paper-like substance, and while it shuts the young bee up, it still allows him a chance to breathe through the pores of the capping. He is given his last feed, and the nurses seem to say, "There! you have been fed enough; spin your cocoon, and take care of yourself."

I wish, my friend, I could tell you what happens after this, but I have not yet been able to see. As a general thing, the young bee is left covered up until he gnaws off the capping, and comes out a perfect bee. This will be in about 21 days from the day the egg was laid, or it may be 20, if the weather is very favorable; therefore he is shut up 10 or 11 days. Now, there is an exception to this last statement, and it has caused not a little trouble and solicitude on the part of beginners. During very warm summer weather, the bees, for one reason or another, decide to let a part of their children go "bareheaded," and therefore we find, on opening a hive, whole patches of young bees looking like silent corpses with their white heads in tiers just about on a level with the comb. At this stage of growth, they are motionless, of course, and so the young bee-keeper sends us a postal card, telling us the brood in his hives is all dead. Some have imagined that the extractor killed them, others that it was *foul brood*; and I often think, when reading these letters, of the family which moved from the city into the country; when their beans began to come up, they thought the poor things had made a mistake, by coming up wrong end first; so they pulled them all up, and replanted them with the bean part in the ground, leaving the proper roots sprawling up in the air. My friend, you can rest assured that the bees almost always

know when it is safe to let the children's heads go uncovered.

As it is, many times, very important to know just when a queen was lost, or when a colony swarmed, you should learn these data thoroughly; for instance, it will be safe to say, 3 days in the egg, 7 in the larvæ, and 11 days sealed up.

The capping of the worker brood is nearly flat; that of the drones, raised or convex; so much so, that we can at a glance tell when drones are reared in worker cells, as is sometimes the case.

The young bee, when he gnaws his way out of the cell, commences to rub his nose, straighten out his feathers, and then to push his way among the busy throng, doubtless rejoicing that he too is one of that vast commonwealth. Nobody says a word to him, or, apparently, takes any notice of him, but for all that, they, as a whole, I am well convinced, feel encouraged and rejoice in their way, at a house full of young folks. Keep a colony without young bees for a time, and you will see a new energy infused into all hands, just as soon as young bees begin to gnaw out.

If you vary your experiment by putting a frame of Italian eggs into a colony of common bees, you will be better able to follow the young bee as it matures. The first day, he does little but crawl round; but about the next day, he will be found dipping greedily into the cells of unsealed honey, and so on for a week or more; after about the first day, he will also begin to look after the wants of the unsealed larvæ, and will very soon assist in furnishing the milky food for them. While doing this, a large amount of pollen is used, and it is supposed that this larvæ food is pollen and honey, partially digested by the young or nursing bees. Bees of this age, or a little older, supply the royal jelly for the queen cells, which is the same, I think, as the food given the very small larvæ.¹⁴ Just before the larvæ for the worker bees and drones are sealed up, they are fed on a coarser and less perfectly digested mixture of honey and pollen. The young bees will have a white downy look, until they are a full week old, and they have a peculiar look that shows them to be young until they are quite two weeks old. At about this latter age, they are generally the active comb builders of the hive. When they are a week or 10 days old, they will take their first flight out of doors, and I know of no prettier sight in the apiary, than a host of young Italians taking their play spell in

the open air, in front of their hive; their antics and gambols remind one of a lot of young lambs at play.

It is also very interesting to see these little chaps when they bring their first load of pollen from the fields. If there are plenty of bees in the hive, of the proper age, they will not usually take up this work until about two weeks old. The first load of pollen is to a young bee, just about what the first pair of pants is to a boy baby. Instead of going straight into the hive with his load, as the veterans do, a vast amount of circling round the entrance must be done, and even after he has once alighted he takes wing again, rushes all through the hive, jostles the nurses, drones, and perhaps queen too, and says as plainly as could words, "Look here! This is I: I gathered this, all myself. Is it not nice?"

We might imagine some old veteran who has brought thousands of such loads, answering gruffly, "Well, suppose you did; what of it? You had better put it in a cell, and start after more, instead of making all this row and wasting time, when there are so many mouths to feed." I said we might imagine this, for I have never been able to find any indication of any unkindness, inside of a bee hive. No one scolds or finds fault, and the children are never driven off to work, unless they wish. If they are improvident and starvation comes, they all starve alike, and as I do believe, without a single hard feeling or bit of censure toward any one. They all work together, just as your right hand assists your left, and if we would understand the economy of the bee hive, it were well to bear this point in mind.

Shortly after the impulse for pollen gathering, comes that for honey gathering; and the bee is probably in his prime, as a worker, when he is a month old. At this age he can, like a man of 40, "turn his hand" to almost any of the duties of the hive; but if the hive is well supplied with workers of all ages, he would probably do most effective service in the fields. see AGE OF BEES.

If a colony is formed of young bees entirely, they will sometimes go out into the fields for pollen when but 5 or 6 days old. Also when a colony is formed wholly of adult bees, they will build comb, feed the larvae, construct queen cells, and do the work generally that is usually done by the younger bees, but it is probably better economy to have bees of all ages in the hive.

BEES ON SHARES. There are ca-

ses, doubtless, where it is advantageous to both parties, to let bees out on shares, but as a general thing, I would advise owning your bees, even though it be but a single colony, before you commence to build up an apiary. It almost always happens that one of the parties is dissatisfied; and as is frequently the case with such partnership arrangements, both the parties have been wronged, to hear their story for it.

I believe it is customary for one of the partners to furnish the bees, and the other to do the work; at the end of the season, everything is divided equally. If new hives, Italian queens &c., are to be used, the expense is equally divided. The division of stock is usually made as soon as the honey season is over, and each party takes his chances of wintering. To prevent any misunderstanding, I would advise that the whole agreement be put in writing, and that whenever something turns up for which no provision has been made, some agreement be made in regard to it, and that this be put in writing also. Instead of inquiring what other folks do, arrange the matter just as *you* can agree, and make up your minds in the outset that you are going to remain good friends, even if it costs all the bees and your whole summer's work.

BLUE THISTLE (*Echium vulgare*). If I am correct, this plant is not a thistle at all, but more properly a near relative of the borage, which it closely resembles. It grows in great profusion in many of the Southern and Middle States, but the principal reports seem to come from Virginia, and the valley of the Shenandoah. As it blossoms fully four months in the year, and produces a beautiful white honey, it would seem that it might well deserve a place among the plants on a honey farm. If we are correct, it needs but little coaxing to cover whole farms, and in Va., we are told there are hundreds of acres of it growing wild, as a weed. Over 200 lbs. of white box honey have been reported from it, from a single colony, in one summer. A field of blue is no doubt a very pretty sight to the bee-keeper, but to the farmers, who find it a great pest, it may not look so handsome. We have really no right to make our honey farm a nuisance to the neighborhood, by bringing in foul weeds; so perhaps you had better take your bees down where it grows, instead of sending for seeds.

Sept., 1880.—Recent reports indicate that it is no worse weed than the borage. It dies root and branch every fall, and is therefore entirely unlike the dreaded Canada thistle.

BORAGE (*Borago Officinalis*). This has been at different times recommended for bees, but as those making the experiment of planting several acres of it did not repeat it in succeeding years, I think we are justified in concluding it did not pay. I have raised it in our garden, and some seasons the bees seem very busy on it. It has a small blue blossom, and grows so rapidly, that a fine mass of bloom may be secured by simply planting the seeds on the ground where you dig your early potatoes. If it is to be raised by the acre, it should be sown at about the same time and much in the same manner as corn, in hills or broadcast.

In 1879 I had a half-acre of it. It was moderately covered with bees for many weeks, but was much inferior to the Simpson honey plant.

BUCKBUSH (*Symphoricarpos vulgaris*). This bush is sent in every season as a wonderful honey-bearing plant, although on our hands it has not amounted, as yet, to very much. It is nearly allied to the snowdrop, which it resembles, only the berries are small and red, instead of white. It is sometimes called the "coral-berry," from its looks. Its



BUCKBUSH.

botanical name comes from the fact that *sym* means *together*, or crowded. *Pherein* means to *bear*, or carry, and *carpus* means *fruit*; so that the name means, we might say, "bearing fruits crowded together." I believe it is usually found in the woods, and in some localities is reported to furnish some very nice honey. I do not know that very much is done in the way of cultivating it for honey. The common snowdrop (*Symphoricarpos racemosus*) sometimes bears considerable honey, but probably not as much as buckbush.

BUCKWHEAT. We have had reports from three different kinds; the black, the gray, and the Silver Hull. The two former are old varieties, and are much alike; the latter is new, and as usual, great things are claimed for it. We have had a piece near us this season; it has given about as much honey as the common varieties, but so far as we can discover, but little if any more. It bids fair to give a greater yield, and is therefore, perhaps, somewhat preferable. It will certainly pay for bee-keepers to raise

buckwheat, and if they are not land owners, they can furnish the seed to the adjoining farmers free, or pay them a dollar or two per acre for the honey it yields. Although this is not a buckwheat country, I think it pays me, taking seasons as they come, to pay \$1.00 per acre for all that is sown within $1\frac{1}{2}$ miles of my apiary, and if there should be 50 acres sown, it would please me all the better. Some such plan as this, is probably the safest investment we can make in the way of artificial pasturage. The honey is dark, and but few people like the flavor of it, after they have used it a little time, but it seems perfectly wholesome for winter, saves purchasing sugar, all trouble of feeding, encourages brood rearing in the fall, and keeps the bees away from the groceries and dwellings, to a certain extent.¹⁵

CULTIVATION.

Buckwheat will grow and blossom on almost any soil, but if you want it to *pay* for either honey or grain, it should have good rich land. It is sown broadcast, about 3 pecks of seed per acre. The best crop of buckwheat honey we ever had here, was from a piece prepared for and planted with corn. The corn was so nearly killed by cut worms that it was harrowed over nicely and sown to buckwheat in the latter part of June. This is almost a month earlier than buckwheat is usually sown here, but the yield was such that, from the two acres, we had at least 200 lbs of comb honey, besides the large amount that must have gone into the brood apartments.

The bees that gathered the largest part of this were dark hybrids; the pure Italians were at the same time storing white honey from red clover. It was amusing to see hives side by side both working in the section boxes, one of which made white combs and honey, like that in June, while the other built combs of a golden yellow, and stored it with the dark rich looking buckwheat honey. As the hybrids gave quite a large crop of this dark honey, I began to be a little partial to them, but after the boxes were all removed, I found they had put it all above, and left their brood apartment almost empty, while the more prudent Italians, had filled the brood combs until they were in excellent condition for winter. It has been several times advanced that the blacks and hybrids are ahead, when nothing but buckwheat honey is to be found in the fields.

BUYING BEES. With every A B C scholar who wishes to commence, or at least make a trial, with bees, the question natu-

rally arises, "How shall I proceed to get a start?" Before I can answer the question, I should want to know something about you. To one who has very little money to spare, and expects to keep bees for the money they will furnish, as well as for pleasure, I would give a little different advice from what I would to some professional man who wants them as an ornament to his grounds, and who has more money than time. The latter, I should probably advise to purchase a colony or two of pure Italians, in a chaff or lawn hive, with all the section boxes, etc., ready for the bees to go right to work. If, on the other hand, you want the bees principally to fill up your spare moments, and wish to commence with the least possible expense, I would advise you to purchase one or two hives of common bees in your own neighborhood, and do all the rest yourself. You can get them at almost any season of the year you choose, and, if you are in the mood, I should say the sooner you get them the better. If you can choose from a number of stocks, take those having the greatest amount of bees and stores, other things being equal. If you can turn up the hive so as to examine the combs, smoking the bees a little to make them get out of the way, choose one having straight, regular cards of comb, for it will be much easier to transfer. I would not purchase more than two or three colonies to commence with. When you have learned to handle these few to your satisfaction, it will be time enough to think of more; and two colonies can be made to build up a large apiary, of themselves, if you manage them according to the latest methods. For directions in regard to mov-

ing them home, see MOVING BEES. As to price to be paid, I would suggest that you should not pay for common bees in box hives more than about \$3.00 or \$4.00 in the fall or early winter, and perhaps \$5.00 or \$6.00 in the spring or summer. Do not pay one cent more for bees in any kind of patent hives. When you get them home, and they are settled nicely, and flying if it is warm weather, you are ready to transfer them as per instructions under TRANSFERRING. After they are well over the shock of being transferred, give them an Italian queen, as per instructions in INTRODUCING, and you are then fully started for business. I think it an advantage for you to perform all these operations yourself, even though you should make bad work of it the first time, because it gives you valuable experience.

I would once more emphasize the importance of commencing with a very few stocks. A young man once came to me to know if he would not better buy 40 colonies to commence with, as they were offered him very low, and he was quite sanguine he could manage them. Although I advised him quite strongly not to take them, he decided to run the risk. In less than a year, he had lost the greater part of them. Nevertheless he became an enthusiast, bought more, and increased until he had over a hundred. But, when winter came, he lost heavily; and so on for several seasons, until his friends plead with him to give up bees. He finally came down to only a few colonies, which he kept strong and in good order, and he is now one of the most successful apiarists we have in our neighborhood, in wintering his bees.

C.

CAGES FOR QUEENS. These are for introducing, for sending them both by mail and express, and for keeping them safely many times about the apiary, especially when we find several just hatched out in a hive. For introducing only, a cage made by simply rolling up a piece of wire cloth will do, many times, but as this gives us no perfectly sure method of supplying the queen with food, I can but regard it unsafe, for queens have frequently been found starved when the cage was pushed between two combs of sealed honey, the bees having removed all the honey from around the cage, as they almost always do when a comb is crushed. To be on the safe side, it would seem best to have a good supply of food in the cage at all times. If this supply is given in the form of honey, there is almost always a liability of the bees and queen getting more or less daubed or smeared with it, and unless this can be soon removed by other bees they are sure to die sooner or later, for the breathing tubes located in different parts of their bodies are easily closed by sugar or honey, if it is allowed to dry on them. Honey in a sponge has been one of the most successful ways of giving a supply for long journeys, but even this is apt to give them a dauby look, and I have several times found bees, and sometimes the queen, wedged into or under the sponge, dead. One of these was an imported queen, and as all the bees with her were spry and active, I could but think she had got entangled under the sponge, and died from this alone. Candy has been used for some time quite successfully; the only difficulty seems to be in providing just enough moisture and no more.

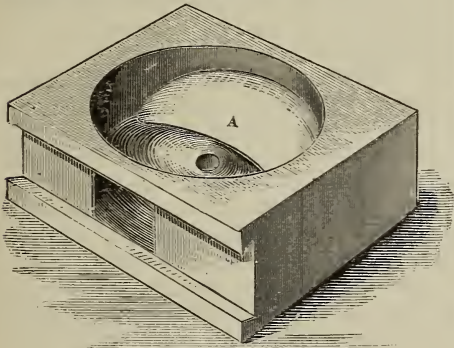
Besides the above-mentioned wants, we want a queen cage that can be cheaply made, especially if we are going to sell queens for a dollar. I will tell you how we make them, and as it involves principles that should be observed in the manufacture of any article by machinery, I will give the details rather at length.

Get some clear pine lumber, dressed on both sides, to about $\frac{3}{4}$ in thickness. Cut it up in lengths of 6 or 8 feet as may be most convenient. Saw these into strips 2 inches in width. With a very sharp centre bit, we bore holes in the strips $1\frac{1}{2}$ in diameter; the holes, which are bored so nearly through as to leave about $\frac{1}{2}$ of wood at the bottom, are just $\frac{1}{2}$ inch apart; that is, there is just $\frac{1}{2}$ inch of solid wood left between each two holes. The holes can be bored by hand, but a lathe is much more expeditious. If the small hole made clear through by the spur of the center-bit is set over a small pin or nail every time the stick is moved along, they can be spaced very quickly, and very exactly. The pin is of course driven in the block of wood fastened to the movable centre of the lathe. We bore about 4 holes a minute, on an average. Now if we should tack wire cloth over these holes, and saw up the stick, we should have queen cages, but we are not nearly ready to do this yet. We do not wish to be to the trouble of prying out the tacks every time we wish to open our cage, and so we must make some kind of a nice little door for the purpose. As boring holes and hinging doors is too slow if we can get rid of it, we make openings into all the cages at once, by plowing a groove the whole length of the stick, just deep enough to cut into the cages. This is quickly done with a carpenter's plow, and the groove is afterward made beveling so as to hold the sliding strip, by running the strips, while held at an angle, over a buzz saw. Now saw some long thin strips of well seasoned pine, to just slide closely into these grooves, and when the cages are cut up we shall have a sliding door in each; but we are not yet ready to cut them up.

CANDY FOR BEES AND QUEENS AND—LITTLE FOLKS.

Get a tin saucepan, and put into it some coffee sugar with a little water—a very little water will do. Make it boil and stir it, and when it is done enough to “grain” when

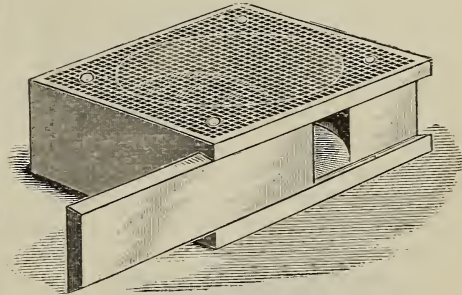
stirred in a saucer, take it quickly from the stove. While it is "cooking," do not let the fire touch the pan, but place the pan on the stove, and there will be no danger of its burning. Cover the dining-table with some newspapers that you may have no trouble—some daubs to clear up, and place your long sticks of cages upon it. Lay one in front of you, with the back edge where the slide is, slightly raised. Now stir your syrup in the saucepan, until it will be just right to pour into tins for "sugar cakes," and you are ready to ladle it into the queen cages with a spoon. Fill them about as full as our artist has shown in the cut below, as at A.



MANNER OF PUTTING THE CANDY IN THE QUEEN CAGE.

Go on to the next, and work as fast as you can, but be sure you do not get any hot candy on the wood except in the cages, and do not get any on your fingers. Our boy who does the work thinks you will remember after you have tried it about *once*. If your candy was right, it will be dry and hard on the outside when cold, but comparatively moist on the inside, and if you try to get it out of a cage, you will be satisfied that it will never get loose and "bump" the bees. To see when it is just right you can try dropping some on a saucer, and while you are at work, be sure to remember the little folks who will doubtless take quite an interest in the proceedings, especially the baby. You can stir some until it is very white indeed for her; this will do very well for cream candy. We have formerly made our bee candy hard and clear, but in this shape it is very apt to be sticky, unless we endanger having it burned, whereas if it is stirred we can have dry hard candy, of what would be only wax if cooled suddenly without the stirring. Besides we have much more moisture in the stirred sugar candy, and we want all the moisture we can possibly have, consistent with ease in handling.

If you have not wire-cloth doors and windows to keep out the flies, you will have to bundle up your sticks of cages as soon as you get the candy in them, or the flies will soon make them—unpresentable. After the candy is all in, dress both edges of your strips nicely, put them side by side, screw them in the iron clamp shown in SECTION BOXES, and saw them up into square blocks. Boys of 10 years old, will cut and nail on the tinned wire cloth with tinned tacks, and sandpaper the rough edges as well as anybody else. If the wire cloth has the rough edge folded under, on each of the four sides, the cages will not be catching on clothing, etc., as they do when the rough ends are left exposed. If you make the boys do their work well, your cages should look about like this:

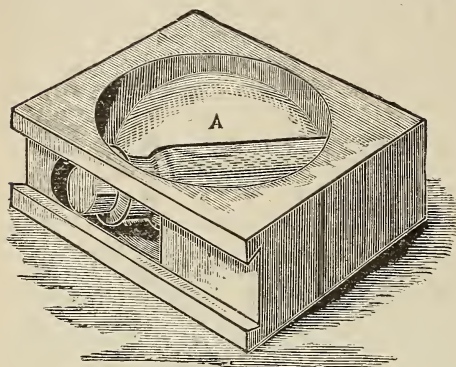


QUEEN CAGE COMPLETE.

The above was written several years ago, and we have since had much experience. Queens have been sent all over the U. S., to Colorado, Oregon, California, Texas, &c.; and we have generally succeeded while the candy was just freshly made, but have had many failures, in the case of long distances, where the candy had become dry and hard. As it is quite inconvenient to make the cages every day, just as we want to ship the queens, a little 2 dram vial filled with water, has been added to the cage. A little notch is cut in one side of the cork, just large enough to let the bees get their tongues in; if it is too large, the water will be shaken out by transportation. The vial is put into the cage through the opening under the slide, and is held in place by a hole bored through into the opposite side, as shown in the cut on next page.

By keeping the vials supplied with water, we have kept queens in perfect health, more than 6 weeks, in these bottle cages. A dozen bees and queen will consume about a dram of water per week. For long distances, such as California, Texas, &c., we put two cages together so that the vials lie in oppo-

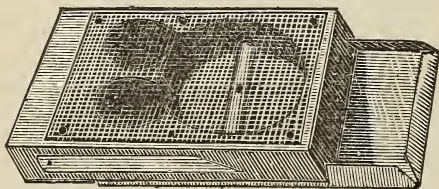
site ways; that is, so that the water is over the orifice of one or the other of the vials, no matter what the position of the cages



THE BOTTLE QUEEN CAGE.

may be. In warm weather, it is not necessary to use more than from 12 to 20 bees to keep the queen company, but for cool weather and for long distances, I would use 30 or 40, or with a double cage, perhaps, even more.

It is now July, 1883, and a new cage, and, to a certain extent, new way of introducing, has been quite successful during the past two years.



PEET'S INTRODUCING AND SHIPPING CAGE.

The cut above will make the whole matter plain, almost without a description. The cages are made by boring the holes, as seen in the cut in strips of plank, and afterward ripping off strips that will plane up about $\frac{1}{2}$ inch thick. The large hole $1\frac{1}{2}$, and the smaller ones $\frac{1}{2}$ of an inch in diameter. The tin slide is cut and folded so as to slide in, as shown in the drawing. After it is in, and before putting on the wire cloth, a sort of candy, made of powdered loaf sugar and honey, is put into the smaller holes, with a putty-knife or spatula. The sugar and honey are better to be well stirred together several days before using.

This candy was suggested by I. R. Good, Nappanee, Elkhart Co., Indiana, and holds moisture, during ordinary summer weather, for from a week to ten days, without any water. To prevent the wood from absorbing the honey, I have for the past few weeks,

been putting it in a little glass bottle like the one shown on the bottle queen-cage, and it seems to answer nicely; of course, the cork is left out, and the bees go in as they would go into a cell of honey. The especial feature of this cage, invented by T. O. Peet, at present editor of the *Bee-Keepers' Exchange*, Canajoharie, New York, is for introducing queens. When the cage is received, the tin points shown on the side are turned down and pressed into a level place on the surface of a brood-comb taken from the hive. The slide is now withdrawn, and the queen and her attendant bees are caged on the comb. If the bees have not got her out after forty-eight hours, she can almost always be liberated safely by that time. See INTRODUCING QUEENS.

The cage had better be put on sealed brood, for then there will be less danger of the bees gnawing them out too soon. If the cage can also be made to cover a few cells of fresh honey, it will be all the better for a queen that has been on a long trip, for there is nothing like being on a comb, right in a hive, for a queen that is any way feeble. As the queen is usually liberated by the bees, she gets out without any such disturbance as opening the hive, etc., and this is, I suppose, one reason why the Peet cage to-day stands ahead of all other methods. When the cage is to be sent by mail, a little board is put over the wire cloth having a groove in it, to admit air, and the whole is then tied with stout flour sack paper, with holes punctured for ventilation.

CANDIED HONEY. All honey, as a general thing, candies at the approach of cold weather. It has been suggested that thin honey candies quicker than thick, and such may be the case; for honey that has been perfectly ripened in the hive, that is, has been allowed to remain in the hive several weeks after being sealed over, will sometimes not candy at all, even if exposed to zero temperature. As some honey candies at the very first approach of cold weather, and other samples not until we have severe freezing weather, we can not always be sure that perfect ripening will prove a preventive. It is very seldom indeed that we find sealed comb honey in a candied state,¹⁶ and we therefore infer that the bees know how they can preserve it best for their use; for although they can use candied honey when obliged to do so, it is very certain that they dislike to bother with it, for they often carry it out to the entrance of their hives when new honey is coming in, rather than

take the trouble of bringing water with which to dissolve it.

HOW TO PREVENT HONEY FROM CANDYING.

By following out the plan of the bees, we can keep honey in a clear, limpid, liquid state, the year round. The readiest means of doing this, is to seal it up in ordinary self-sealing fruit jars, precisely as we do fruit. Maple molasses, syrups, and preserves of all kinds, may be kept in the same way if we do our work well, almost as fresh, and with the same flavor, as the day they were put up. We should fill the jar full, and have the contents nearly boiling hot when the cover is screwed on.¹⁷ The bees understood this idea perfectly, before fruit jars were ever invented, for they put their fresh pollen in the cells, cover it perfectly with honey, and then seal it up with an air tight wax cover. To avoid heating the honey too hot, it may be best to set the fruit jars in a pan of boiling water, raising them up a little from the bottom, by a thin board. If the honey is over-heated, just the least trifle, it injures its transparency, and also injures its color; in fact it seems almost impossible to heat some kinds of honey at all, without giving it a darker shade.

CANDIED-HONEY CONFECTIONERY.

If you allow a barrel of linden or clover honey to become candied solid, and then scoop out the centre after one of the heads is removed, you will find, after several weeks, that the honey around the sides has drained much after the manner of loaf sugar, leaving the solid portion, sometimes, nearly as white as snow, and so dry that it may be done up in a paper like sugar. If you now take this dry candied honey and warm it in an oven until it is soft, it can be worked like "taffy," and in this state you will pronounce it, perhaps, the most delicious confectionery you ever tasted. You can also make candy of honey by boiling, the same as molasses, but as it is little if any better, and much more expensive, it is seldom used. See EXTRACTED HONEY.

CANDY FOR BEES. Very little is to be added to the directions just given for making candy for the queen cages, except that we are to work with larger quantities.

If your candy is burned, no amount of boiling will make it hard, and your best way is to use it for cooking, or feeding the bees in summer weather. Burnt sugar is death to them, if fed in cold weather. You can tell when it is burned, by the smell, color, and taste. If you do not boil it enough, it will be soft and sticky in warm weather, and

will be liable to drip when stored away. Perhaps you had better try a pound or two at first, while you "get your hand in." Our first experiment was with 50 lbs.; it all got "scorched" "some how."

As the most convenient way of feeding candy that will probably be devised is to put it into your regular brood frames (*wired*, as per p. 53), I shall give directions for making it in that form. If you do not like it so, you can break it out, or cut it in smaller pieces with a knife, when nearly cold.

Lay your frame on a level table, or flat board; perhaps you had better use the flat board, for you need some nails or wires driven into it, to hold your frame down close, that the candy may not run out under it. Before you fasten the frame down, you will need to put a sheet of thin paper on your board, to prevent the candy's sticking. Fix the board exactly level, and you are all ready to make your candy. If you have many stocks that need feeding, you can get along faster, by having several boards with frames fastened on them. You will need some sort of a sauce-pan (any kind of a tin pan with a handle attached will do) that will hold about 10 lbs. of sugar. Put in a little water—no vinegar, cream of tartar or any thing of the sort is needed, whatever others may tell you—and boil it until it is ready to sugar off. You can determine when this point is reached, by stirring some in a saucer, or you can learn to test it as confectioners do, by dipping your finger in a cup of cold water, then in the kettle of candy and back into the water again. When it breaks like egg shells from the end of your finger, the candy is just right. Take it off the stove at once, and as soon as it begins to harden around the sides, give it a good stirring, and keep it up until it gets so thick that you can just pour it. Pour it into your frame, and get in just as much as you can without running it over. If it is done nicely, the slabs should look like marble when cold, and should be almost as clean and dry to handle. If you omit the stirring, your candy will be clear like glass, but it will be sticky to handle and will be very apt to drip. The stirring causes all the water to be taken up in the crystallization or graining process, and will make hard dry sugar, of what would have otherwise been damp or waxy candy. If you wish to see how nicely it works for feeding bees, just hang out a slab and let the bees try it. They will carry it all away as peaceably as they would so much meal in the spring.

You can feed bees with this any day in the winter, by hanging a frame of it close up to the cluster of bees. If you put it into the hive in very cold weather, it would be well to keep it in a warm room, until well warmed through. Now remove one of the outside combs containing no bees, if you can find such a one, spread the cluster, and hang the frame in the center. Cover the bees at the sides and above, with cushions, and they will be all safe. If a colony needs only a little food, you can let them lick off what they like, and set the rest away until another time, or until another season.

WHAT KIND OF SUGAR TO USE FOR MAKING CANDY.

We have generally used the coffee A, but any of the sugars that are used for feeding will answer for summer. Common brown and maple sugars work nicely, although it is plain to be seen that the bees prefer the better article; for this reason, we have used the latter. Coffee A sugar now costs us 9c. by the barrel, and retails for 10c. As we have to pay a confectioner 2c. for making, the candy cannot well be sold at retail for less than 15c. As much as $\frac{1}{4}$ part of wheat flour can be added to the sugar and it will be nearly as white and hard, but the labor of making is very much more, for it must be boiled very slowly, and stirred to prevent burning. The bees seem to prefer that containing the flour, and it has the effect of hastening brood-rearing, like pollen. After it is stored in combs, it looks like honey except for a slightly milky or turbid appearance, but has a very perceptible flour taste.*

CAUTION IN REGARD TO CANDY MAKING.

Before you commence, make up your mind you will not get one drop of sugar or syrup on the floor or table. Keep your hands clean, and every thing else clean, and let the women folks see that men have common sense; some of them at least. If you should forget yourself, and let the candy boil over on the stove, it would be very apt to get on the floor, and then you would be very likely to get "your foot in it," and before you got through, you might wish you had never heard of bees or candy either; and your wife, if she did not say so, might wish she had never heard of anything that brought a man into the kitchen. I have had a little experience in the line of feet sticking to the floor and snapping at every step you take, and

with door knobs sticking to the fingers when touched, but it was in the honey house. We have a 50 cent stove—came from the tin-smith's old iron heap—that has been made to look quite respectable, and proves very handy for melting candied honey, making candy, warming syrup in cold weather, &c., and if you keep a wash basin and towel near by, and keep the honey house neat and clean, it is a real pleasure to do all this work.

CATNIP. (*Nepata Cataria*). This is a near relative of GILL-OVER-THE-GROUND, which see. Quinby has said that if he were to grow any plant exclusively for the honey it produced, that plant would be Catnip; and very likely he was not far from right. But as we have never yet had any definite report from a sufficient field of it to test it alone, either in quality or quantity of the honey, we remain almost as much in the dark in regard to it as we were at the time he made the statement, several years ago. Several have cultivated it in small patches, and have reported that in a state of cultivation it apparently yielded more honey than in its wild state, for bees are found on it almost constantly, for several months in the year; yet no one, I believe, is prepared to say positively that it would pay to cultivate it for this purpose.

CIDER AND CIDER MILLS. Not only are many of our bees drowned in the cider, in the vicinity of cider mills, but the cider, if gathered late in the season, is quite apt to prove very unwholesome as a diet for our little friends. Probably much of the dysentery that causes such havoc is the result of this unsealed cider stored in the cells when winter comes on. If the colony is very strong, and well supplied with winter stores, the cider may do but little harm; but where they are weak and obliged to use the cider largely, they sometimes die even in the fall. We at one time fed a colony about a gallon of sweet cider, and they were dead before Christmas. At another time a barrel of sweet cider was found to be leaking, but as the bees took it up greedily as fast as it ran out, their owner kindly allowed them to work away. They all died quite promptly, after the experiment.

The bees of a large apiary will take sweet cider from the mill, nearly as fast as it can be made, and we at one time had quite a serious time with the owner of such a mill, because the Italians insisted on "going shares," whenever he made sweet cider. After paying quite a little sum in the way of damages, and losing our bees every season

* Maple sugar, poured into wired frames while hot, makes excellent bee-candy. Cakes of maple sugar laid over the frames answer equally well.

there was a large apple crop, besides buying sugar in the vain attempt to call them away by counter inducements, we, at the suggestion of one of the other sex, hung white cloth curtains over all the openings to the mill. Some strips of pine, \$2.50 worth of sheeting 2½ yards wide, and a couple of hours time, fixed the mill so that scarcely a bee was to be seen inside. In a very short time they gave up flying around the mill, and apparently forgot all about it.

CLOVER (*Trifolium*). The most important of the Clovers, common White Clover (*Trifolium Repens*), which everybody knows, is perhaps at the head of the entire list of honey-producing plants. We could better spare any of the rest, and I might almost say all the rest, than our White Clover that grows so plentifully as to be almost unnoticed, almost everywhere. But little effort has been made to raise it from the seed, because of the difficulty of collecting and saving it.

There is a large variety known as White Dutch Clover, that is sold by our seedsmen, to some extent. I have not been able to gather whether it is superior to the common. The common Red Clover — *T. pratense* — yields honey largely some seasons, but not as generally as does the white, nor do the bees work on it for as long a period.¹⁸ While working on Red Clover, the bees bring in small loads of a peculiar dark green pollen, and by observing this, we can usually tell when they are bringing in Red Clover honey. The Italians will often do finely on Red Clover, while the common black bees will not even so much as notice it. The general cultivation is much like that of **ALSIKE CLOVER**, which see; but the safest way for a beginner is to consult some good farmer in his own neighborhood, as different localities require slightly different treatment. The same will apply to saving the seed, which can hardly be saved profitably, without the use of a clover huller, made especially for the purpose.

While most persons seem to tire, in time, of almost any one kind of honey, that from Clover seems to "wear" like bread, butter and potatoes; for it is the great staple in the markets, and where one can recommend his honey as being pure White Clover, he has said about all he can for it.

There are quite a number of other clovers such as Lucerne, white and yellow Trefoil, Alfalfa, Esparcette, &c., but none have been sufficiently tested to warrant recommending them much. Strong statements are made

in regard to the value of white and yellow Sweet Clovers, and the former under the name of *Melilotus Leucantha* was quite extensively sold some years ago. From the fact that those who invested in it gradually dropped it, I would not advise investing much money in it to commence with.

Sweet Clover (*Melilotus alba*, or *Melilot*), has some valuable traits, as standing frost, and drouth, but many times and seasons, the bees will hardly notice it at all. The statement has been made that an acre will support 20 colonies of bees, and afford from 500 to 1000 lbs. of honey. As it is quite difficult to get accurate figures in the matter, I think the statement should be received with due allowance; about 4 lbs of seed are needed for an acre, sow like alsike. It will grow on almost any barren hillside, but it is a bad weed to exterminate; if however, it is mown down to prevent seeding, the roots will soon die out.*

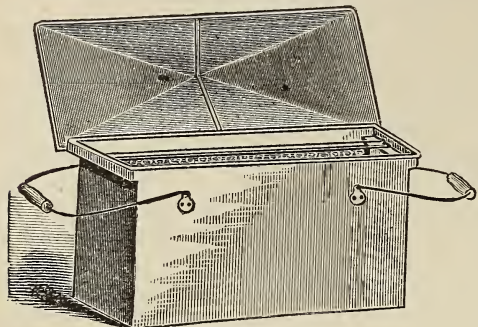
COMB BASKET. When the bees are gathering no honey, especially during the lull that usually intervenes between spring and fall pasturage, it is many times quite difficult to remove combs of brood, or open hives at all, without getting robbers at work. Any one who has had quite a time with robbing bees will remember for some days, that it makes trouble to leave a comb outside the hive while we are handling others inside. Robbing bees will get at them, and soon they will learn to follow us about, and finally "dive" right into the unsealed honey the minute a comb is exposed. Suppose we do not have robbers; still, when we take a frame out of a hive, it is very convenient to have some place where we can set it down safely, while we look at the rest. If we stand them up against the hive, or one of the posts of the grape vine trellis, unless we are very careful, bees are killed, and if the day is a windy one, the comb is quite apt to be blown down in the dirt. To avoid all these mishaps, we have sometimes carried about an empty hive, but this is unwieldy, and does not keep away robbers either, unless a cover is carried with it. Comb baskets have been made of wood, but these are unsightly unless kept painted, and if any honey drips from the combs, it soaks into the wood in a way that is far from be-

* Sept., 1880. — We have had, this season, half an acre covered with a most luxuriant growth of melilot, but it certainly is not a profitable honey plant with us.

Nov., 1882. — This season the bees have been so exceedingly busy on it, we have materially changed our opinion, and are preparing to give it a more extended trial.

ing tidy. The one shown in the engraving is made of light tin, and I believe meets all requirements.

It can be readily carried from hive to hive, and the light cover is very quickly closed bee-tight, whenever occasion may require.

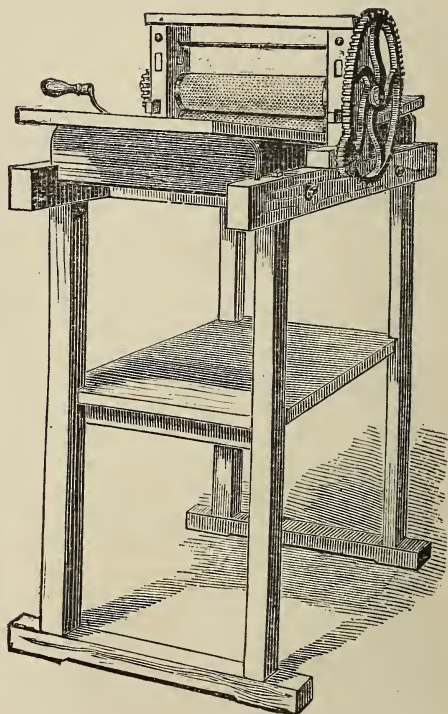


COMB BASKET.

Where extracting is done indoors, the basket can be used to very good advantage, for five heavy combs are about as many as one cares to carry at once. The combs should hang on metal rabbits the same as they do in the hive, to avoid crushing bees when they are set in hastily. Your tin-smith should be able to make you one like the above, for about \$1.25.

COMB FOUNDATION. Since the introduction of this fdn., within the past few years, many difficult points have been solved completely; such as, how to insure straight combs, how to insure all worker comb or all drone comb, as the case may be, and how to furnish the bees with the wax they need without being obliged to secrete it by the consumption of honey. It is so simple a matter to make a practical test of it by hanging a piece in a hive when honey is coming in, that I think I may be excused from describing the way in which the bees use it, at any great length. Neither will it be needful to dwell on the successive steps by which it was discovered, and brought to its present state of perfection. The first mention we have of wax foundations that were accepted by the bees, was published in the German Bee-Journal as far back as 1857. Mr. J. Mehling, of Frankenthal, Germany, if I am correct, seems to have been the original inventor. For nearly 20 years, the matter seems to have slumbered, although different ones at different times, among whom was our friend Wagner, took it up, made some improvements, and dropped it again. The sheets made in both England and Germany, had no side walls, but simply indentations. Mr. Wagner added shallow

side walls, making it much more like natural comb. Until recently, it was all made with a pair of plates, but it did not require much wisdom to decide that such an article, if wanted in large quantities, should be rolled out by machinery. In the latter part of 1875, I talked with a friend, who is quite an artist in the way of fine mechanical work and machinery, and told him what I thought was wanted. The result was that he made a machine for me, of which I submit the engraving below, that would roll out a continuous sheet, with very fair side walls of wax, and perhaps superior to any thing before made. Since then he has made machines for many parties in our own country, and they have also been sent to both England and Scotland. Mr. A. Washburn, of Medina, O., is the inventor and manufacturer of these machines. Many tons of wax have been worked up during the present year—1877—and the demand is increasing so steadily, that it is quite probable the supply of wax will be the only limit to its manufacture and use.



ORIGINAL FOUNDATION MACHINE WITH 12 IN. ROLLS.

Many experiments have been made with a view of substituting something in place of real bees-wax, such as paraffine, ceresin, and the like, but all, so far, have resulted in failure. Paraffine will make beautiful fdn., and the bees will accept it at once, but as soon as

we have warm summer weather, the beautiful comb, honey and all, will fall down in a shapeless mass in the bottom of the hive.

HOW TO MAKE THE WAX SHEETS.

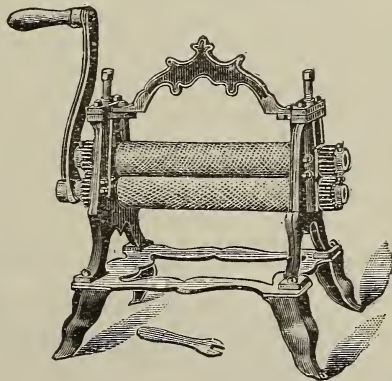
This is done by dipping a sheet of thin wood in a tall vessel of melted wax. The wax must be neither too hot nor too cold, and the dipping-plate must be kept wet by immersing it in tepid water before each sheet is dipped. The dipping-plate is about one-fourth inch in thickness, $9\frac{1}{4}$ wide, and about 36 inches long, with the edges rounded to a blunt knife-edge. This size will give sheets of such size that each one will make two for an L. frame. When the plate is first used, you will probably have to soak it for a time with water, to make the wax come off readily; and when it gets roughened it must be dried and scraped or sand-papered until it is smooth again. Brush the water over the plate well, to make it adhere, and you are then ready to plunge it into the melted wax. When it touches bottom, lift it out immediately, and hold it above the melted wax until the wax has cooled enough to allow it to be dipped the other end down. We usually dip four times; but if the wax is pretty warm, you may have to dip six times. After the last dipping, as soon as it has ceased to drip, dip it all over in the tub or tank of cool water. Take it out and commence to strip off the sheets. If too hot, the wax will break, and if too cold it will stick; in the latter case you must scrape the wax off with a knife, and try again. After a little practice, you will make it go as fast as the sheets can be handled. Two hands are needed to work rapidly. One dips, and the other takes off the sheets, and brushes and wipes the dipping-plates. Now your tub of water will very soon get warm, and as this will not do at all, cold water must be added. If much work is to be done, a tank made of boards is best, with an apartment for cold water in one end of it. Besides, the wax will be rapidly cooled, and at the same time lowered; to keep up the supply, we have a boiler on the stove, with a honey-gate attached. This boiler is made large enough to take in the ordinary cakes of wax of commerce, and should be made deep so as to set down into the stove for the purpose of getting the advantage of rapid heating, and to allow all impurities to settle. Besides this, the boiler must be made double, and the outer space filled with water, for if wax is burned in the least, it is utterly spoiled for comb-making. That we may get only the pure wax, the gate is put in near

the top of the boiler, to allow all the impurities to settle to the bottom, and it has a sheet of fine wire cloth put in so as to strain the melted wax before it passes through it. In our factory, the wax is melted by a series of copper pipes through which steam passes. The tin can that holds these pipes is simply the can of Honey-Extractor, as seen on another page.

Wax sheeted in this way, is of a light beautiful yellow, and the fdn. is fit for use in the surplus boxes, without any sort of bleaching. When you start up, your dipping-boiler must be full of melted wax, and we have this also made double, with hot water all round it, that we may set it in the stove in place of the other when starting. With the above arrangement and number of hands, 200 lbs. can easily be dipped in a day. Separate lots of wax can not well be worked alone, unless of 100 lbs. or more; as the above process will make bright wax out of the worst looking, it can hardly be thought desirable, to work lots separately.

ROLLING THE WAX SHEETS.

The machine shown below, is the size for the Langstroth frame for rolling sheets 9 inches wide. We at first covered the rolls with a lather made of soap and water, to prevent the wax sticking; but, for obvious reasons, slippery elm was substituted for the soap, and afterward it was found that



FOUNDATION MACHINE WITH 10-IN. ROLLS. starch, prepared just as the women use it, was just as good as any thing. When the rolls are new, the wax will sometimes bother a great deal; but if the particles are carefully picked out with a quill toothpick—any thing harder might injure the rolls—and the rolls, as well as the sheet of wax, are kept well covered with the starch, it will soon come out nicely. As soon as the edge gets through, it is to be picked up with the fingers, then held between two pieces of wood,

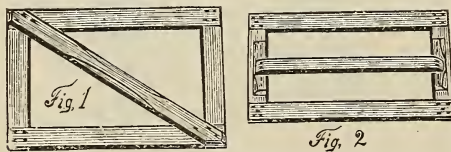
and drawn out as fast as the rolls are turned. Two hands, after a little practice, will roll it, with a 10 inch machine, about as fast as it can be dipped. The sheets roll with less trouble from sticking, if allowed to stand a couple of days after being dipped, as the wax hardens slightly by being exposed to the air. This explains why bleached wax is harder than the common yellow. On this account, the bees work the bleached wax so much slower, that I would not advise its use, even for box honey.

For box honey or sections, we want the base of the cell, about as thin as natural comb, and to get this, we screw the rolls down close and roll only narrow strips, say $3\frac{1}{2}$ inches wide, for the 1 lb. sections. Wide sheets can not be rolled *very thin*.

TRIMMING, SQUARING, AND CUTTING THE SHEETS.

As the sheets are taken from the rolls, lay them squarely upon each other, until you have a pile 2 or 3 inches high. Now lay on them a board cut the exact size you wish the fdn. to be, and with a sharp, thin bladed, butcher, or other knife, cut through the whole, all around the board. To prevent the knife from sticking, dip it occasionally in the starch, such as is used in rolling the sheets. To have the knife work nicely, you should have a coarse whet-stone near by, with which to keep the edge keen. As the board is liable to shrink, warp, and get the edges whittled off, where a great number of sheets of a particular size is wanted, we have frames, made sharp on their edges and lined with tin. The tin is folded, and put on so that the edge of the knife does not strike it, if the blade is held in the proper position.

To cut sheets 12 by 18, we have a frame made as follows:



FRAMES FOR CUTTING SHEETS FOR BROOD FRAMES.

The diagonal piece in figure 1 serves as a brace to keep it true and square, and also for a handle to lift it by. The frame is placed over the sheet so as to cut to the best advantage, and the knife is run around it. Figure 1 is for cutting sheets 12 by 18, and figure 2 for the L. frame, 8 by $16\frac{1}{2}$ in. For the wired frames shown on the next page, the sheets are to be cut $8\frac{1}{2} \times 17\frac{1}{2}$.

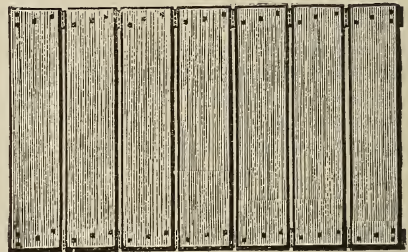
For cutting a great number of small pieces,

such as starters for sections, a pair of frames like those shown in the engravings below are very convenient.

Fig. 1.



Fig. 2.



MACHINE FOR CUTTING STARTERS FOR SECTION BOXES.

Fig. 1 is composed of seven $\frac{1}{4}$ -inch strips, $1\frac{1}{2}$ inches wide, by about 20 inches long. The spaces are just wide enough to allow the knife to run between them. Fig. 2 is composed of the same number of boards, but they are $3\frac{1}{2}$ wide, by about 16 long. You will observe that this allows one frame to be placed over the other, each fitting in between the cleats of the other. To use the machine, place a sheet (or sheets) of fdn., say 12 by 18, on Fig. 1, and lay Fig. 2 over it. Run the knife through all the spaces, and then turn the whole machine over. Now run it through as before, and your sheet is cut into oblong pieces, just such as we put in the $4\frac{1}{2}$ section boxes when we ship them in complete hives. We should perhaps use pieces somewhat larger, were it not that there would be greater danger of their breaking out with the rough handling they get when the hives are sent by freight. The pieces, as made with the above frames, are $1\frac{1}{2}$ by $3\frac{1}{2}$ inches.* If much work is to be done with these frames, they had better be covered with tin, like the frames before mentioned.

FOUNDATION FOR COMB HONEY.

The only trouble with it for comb honey

*At this date, May, 1883, the decision is strongly in favor of having the thin fdn. entirely fill the sections, and for the Simpliety sections, they are cut $3\frac{1}{4} \times 3\frac{1}{4}$, made of fdn. with the base about as thin as natural comb. If the fdn. is properly made, the honey will be in no respect different from that stored in natural comb.

is that, under some circumstances occurring very rarely I believe, the bees will build on to the fdn., without thinning the center at all, as they usually do. I believe this is more apt to occur, when a good yield of honey comes during rather cool weather, the bees being unable to get the wax warm enough to work readily. The remedy for this will be in making the base of the cells of the fdn. exceedingly thin, and the small 5 inch machines seem best for this purpose. We have made machines for making the fdn. four, four and a half, and five cells to the inch. The latter is now agreed by all, I believe, to be best for the brood apartment, the others being used for comb honey. As the queen is not much disposed to lay eggs in the fdn. $4\frac{1}{2}$ cells to the inch, it may serve an excellent purpose; but as the bees can work the fdn. with 4 cells to the inch (drone comb) faster than any other during a yield of honey, this size will perhaps be used.

Fdn. with flat bottomed cells, is used by the bees, but I cannot think with the same facility as that having the natural shape.



CARLIN'S FOUNDATION-CUTTER.

This implement was invented by C. R. Carlin, of Shreveport, La., and is intended to take the place of a knife. It is cheaply made, with a wheel of tin, but better ones have a steel wheel. After using it one season, we find that the greater part of our hands prefer a knife.

SAGGING OF THE FOUNDATION.

At the time of this writing (Nov., 1882), many devices are being tried to prevent the sagging of the fdn., and consequently slight elongation of the cells, in the upper part of the comb. With the L. frames, this is so slight, that it occasions no serious trouble with the greater part of the wax of commerce, but with deeper frames, or with some specimens of natural wax, the sagging is sufficient to allow the bees to raise drones in the upper cells. Paper has been tried, and succeeds beautifully, while the bees are getting honey; but, during a dearth, when they have nothing to do, they are liable at any time to tear the nice combs all to bits, to get out the paper, which I have supposed they imagine to be the web of the moth worm. In our apiary, I have beautiful combs built on thin wood, but as the bottom of the cell is flat, they are compelled to use wax to fill out the interstices, and the value of this

surplus wax, it seems to me, throws the wood base entirely out of the question. I do not like the fdn. with wire rolled in it, on account of the greater expense, and because we cannot fasten it in the frames as securely as we can where the wires are first sewed through the frames.

Aside from the production of drone cells, we want combs that will not break out of the frames in shipping, handling, or extracting, in either hot or cold weather; we also want *frames* that will not sag, no matter how heavily they may be filled with honey.

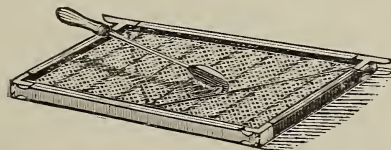
For three seasons, I have been using combs in which the fdn. was rubbed against fine wires stretched across the frame, and we have now in our apiary a thousand or more combs so strong that, although they are new combs just built out, they can be thrown on to the floor, without any danger of injury. Not only this, but by a couple of diagonal wires, we have braced the frames so there is no more sagging of the top and bottom bars, even though they are less than $\frac{1}{4}$ of an inch in thickness. The wires are put in, as in the



L. FRAME WIRED READY FOR USE.

cut shown above, with a thin bar of tin in the center, to support the top bar.

The wire used is No. 30, tinned iron wire. After the wires are in and drawn up tight, the fdn. is cut so as to fill the frame, and the wires are then imbedded into the wax by means of a tuner's soldering-copper, which is hammered down to a fine point bent as in the annexed engraving, and then grooved at the extreme point so it will "ride" upon and follow the wire.



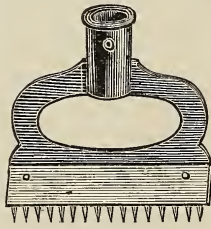
IMPLEMENT FOR FASTENING THE FOUNDATION TO THE WIRES.

The copper is heated over a coal-oil stove, and when it is just right it not only dries the wire and foundation perfectly, but its weight is just right to sink the wire into the foundation, without requiring any pressure from the hand, and it softens the wax so it sticks firmly to every inch of the wire. During the operation the foundation is supported on a level board cut so as to just slip in-

side the frame, and come up against the wires. Now quickly run the copper over each wire, holding it as shown in the engraving. The board is to be kept wet with a damp cloth, to prevent the wax sticking to it. It is to be turned once, of course, to run the wires on each side. Once heating the iron will do for 10 frames.

CARPET-STRETCHER FOR IMBEDDING THE WIRES IN THE FOUNDATION.

July, 1883.—Still another plan has been given us for imbedding the wires in the foundation. It was furnished by George H. McGee, Marblehead, O. The implement for doing it is simply a common carpet-stretcher, like the cut below. It is fitted with a short handle, and then the wax is warmed up so as to be quite soft. The wires are imbedded by laying the points along the wire, and pressing down while the fdn. is supported as in the preceding cut. The advantage of the carpet-stretcher is, that none of the cells are in any way injured, as is the case with the soldering-iron method. With the latter, we sometimes have a row of drone-cells where the wire passed; but with the carpet-stretcher, the bees finish out the cells as perfectly as if nothing of the kind had ever touched them. It may be well to add, that the fdn. is put in the frame in such a way that the diagonal wires are on one side of the sheet, while the vertical wires are on the other. The wires are imbedded by turning the comb over—first one side and then the other.



CARPET-STRETCHER.

COMB HONEY. I would have comb honey stored in section frames, instead of boxes, because they are clean and nice to handle, can be retailed without the troublesome daubing, and above all, because the public will pay a much higher price for honey in that shape. For the same reason, I would have the sections small. I would also have them made to fit inside of your regular hive frame, or rather in a broad frame, made of exactly the same dimensions. This simplifies the work greatly, because we can then hang a frame of sections in any hive, and in either the upper or lower story, as we may have occasion. This is a great convenience, for it enables us to get nice comb honey from any colony, however weak, by simply hanging a frame of these sections, on one or both sides of the brood combs. If the bees have been kept in a small space, so

that every comb is occupied with brood and pollen at the approach of the honey season, they will start in the sections almost at once, if they are given them just as soon as they begin to be crowded for room. Give them a single frame at first, and when they are well at work in this, give them another. Do not put on an upper story, until they are ready to go into it in large numbers. Do not let the bees, by any means, get to

CLUSTERING ON THE OUTSIDE OF THE HIVES.

If you have been "up and dressed, and on hand," they will seldom commence this when honey is to be had in the fields; but if a strong colony gets to hanging out preparatory to swarming, you must get them into the boxes at all hazards. The first thing is to be sure they have room near the brood; the next, that the hive is properly shaded; and we have found it a good thing, many times, to drive them in with smoke. After they once get started at work, you will seldom have trouble with them, but a little neglect may be the means of losing a fine crop of honey. Sections partly filled out by other colonies, will almost invariably set them at work. If you can do no better, divide them; but I should try everything else, before doing this, if my object were comb honey.

HOW TO REMOVE THE FILLED SECTIONS.

I do not know that I ever really enjoyed any work in the apiary more, and that is saying a great deal, than taking off these little section boxes.

I hardly know which plan is quickest; to remove a whole upper story and let the bees leave it and go back into the hive before the sections are taken out, or to pick out the filled sections as fast as completed, and replace them with empty ones. Where you have a large number of hives with the boxes mostly filled, I would adopt the former plan. Lift off the upper story and place it in front of the hive. Now on this first hive, place an empty upper story filled with sections and fdn. After the bees are all or nearly all out, sort out the finished sections, and put the unfilled ones with new sections to fill it out, into an upper story for the next hive, and so on, until we get through. The bees will work on sections partly filled from another hive, just as well as on those from their own, as far as we have been able to discover. Where the work is considerable, a cheap hand can do the sorting and crating as well as anyone else. A girl that is careful, one who will

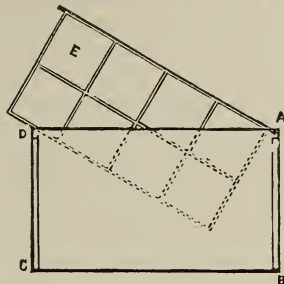
not scatter the sections and knock them over against each other, is just what you want. They are to be handled just like eggs, and the fingers should be so clean, that they will not soil white paper. If you wish your honey to bring the highest price, you must insist that no sections are left standing about, but that each case or upper story, is finished and covered up, before another is opened. There are but two places for all that are found, either in the shipping case, or in the upper stories to go on the next hive. (If you have been so careless as to have some of the fdn. starters that have dropped out, you had better send such sections of honey to the children of some of your neighbors who do not keep bees). If you wish nice clean true work,

ALWAYS USE THE TIN SEPARATORS.

Although you can get sections that do very well as a general thing without them, the expense and bother of having a comb built so that it must be broken before the sections can be separated, or of having even one in 50 bulged into its neighbors in a way that would prevent its going into the packing case, would, with us, pay for the separators for the whole lot, especially as one set will answer for a life time, so far as we know. After the broad frames are procured, with the separators, the only expense is $\frac{1}{2}$ cent each for the sections, and you are not obliged to go to this expense even, until the first lot are filled and ready to sell.

If you are using the chaff hives, or if you have only a few hives, or if honey is coming so slowly that only a small part of the sections are ready to remove, it will be your better way to lift the frames, take out the filled sections and replace them with empty ones, without brushing the bees off at all. If the sections are set down near the entrance, or if more convenient, on the top of the frames you have just examined, the bees will be nearly all off as soon as you are ready to close the hive. It is a very easy matter to take out the finished sections and leave the others, when you once get the hang of it. You can get out the first 2 inch frame without killing a single bee; see page 116. Stand this at one side of the hive in the shade, or in an empty hive if robbers are about much, and then proceed to lift out the next one. Now there is a very convenient way of supporting a frame, while you are cutting out or inserting queen cells, removing a queen for caging, clipping a queen's wings, removing section boxes, and doing a variety of other things, and to be

sure to make it plain, I will give you a diagram.



Let A B C D represent the hive or the upper story of a hive; the frame of sections is shown with one of the ends of the top bar resting in its usual place in the rabbet, while the bottom bar of the frame rests on the opposite rabbet. One advantage of this method of support is that all, or nearly all, the bees will run off from the lower corner—shown by the dotted lines—on to the frames below, and we thus avoid having them scattered about on the ground. It is very plain, that you have every facility in the world, for getting out the upper corner sections, at E; if those adjoining it are finished, they will come out equally easy, and there will be no danger of any of the rest sliding out of place while you are doing it, for they are held securely by gravity; when these are all out and their places supplied with empty ones, you are ready to take those from the other end in the same way. If the bottom sections are all filled before the upper ones, simply turn the frame upside down; your frame is held securely, and you have both hands to work with. When done, put it in place of the first removed, and so on until the whole are finished. If you leave the honey in the hive until the bees have stopped gathering, you will have to get it off in a hurry, or they (especially hybrids) will uncap and carry it below just the minute you commence work with them. Drive them down with smoke, then get out your honey.

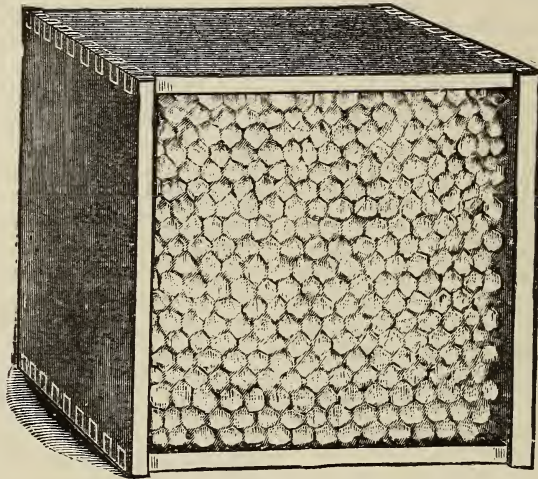
The engraving on next page gives a good idea of the sections we use and recommend. They are $4\frac{1}{2}$ inches square, and $1\frac{1}{2}$ inches thick. I prefer this size, because they contain just about 1 lb. of honey, and 8 of them just fill a Langstroth frame. While these have commanded 25c per lb. at wholesale, sections that held from $1\frac{1}{2}$ to 2 lbs. have only brought from 20 to 22c. This is too great a difference to lose, so long as the bees will put it in one shape just as well as the other. We have tried a great variety of sizes, but the bees seem somewhat loth to store honey in anything very much less in size;

some, $2\frac{1}{2}$ inches in size were very well filled, but it was only after they had filled all the larger ones placed in the same hive.

Of course, you will be methodical enough to have your shipping case by your side when removing sections, that you may put them in their places as fast as they are removed. We can not afford to handle things unnecessarily, to say nothing of having our work scattered about, and in danger of being forgotten or tumbled down in the dirt. When you have your cases filled, tack on a shipping tag, with *your own* address on it, as well as the address of your honey merchant, and it is ready to go. If after a few days you

though they are perhaps as cheap and strong as almost any box we could make especially for the purpose, they are not exactly what is wanted. The broad frames, and tin separators occupy considerable space, and these are just what we can not well spare when we are sending honey to market, for they are wanted to put back into the hives. There is another trouble, which will appear from the following note from our commission house in Cleveland, to whom we sent a couple of the sections as a sample.

The sample of honey is very nice and we think it will sell readily, but we can not tell at what price. Our opinion, however, based upon reports from other markets, is that it will bring more now than later.



A SECTION BOX FILLED WITH HONEY.

should find traces of worms, see BEE MOTIL.

Is it not a satisfaction to have every pound of your honey sold the very minute you get it off the hives, and to have none standing around in the way, waiting for a purchaser?

MARKETING COMB HONEY.

There is nothing that can make a bee-keeper feel better than clean cash for his surplus honey at the end of the season.—*Adam Grimm, page 86, Vol. I, —GLEANINGS.*

Everything, nowadays, depends on having goods neat, clean, and in an attractive shape, to have them “go off” readily; even our hoes have to be gilt edged, for I noticed some at a hardware store a few days ago, and it seemed that those that were gilt, or bronzed perhaps, were selling far in advance of the plain steel ones. We have been told of gilt edged butter, that sold for fabulous prices, but we hardly think it will be advisable to have our honey put up in that way, although we do wish it to look as well as any other of the products of the farm.

In our price list, we advised using the Simplicity hives for shipping cases, but al-

If you have a stock of it, please send us a little lot; do not on any account box it up invisibly tight but pack it so the express men can see what they are handling. Give us your price and we will see how our market will respond; by all means make it low enough to sell readily.

STAIR & KENDEL.

Cleveland, Ohio, July 5th, 1877.

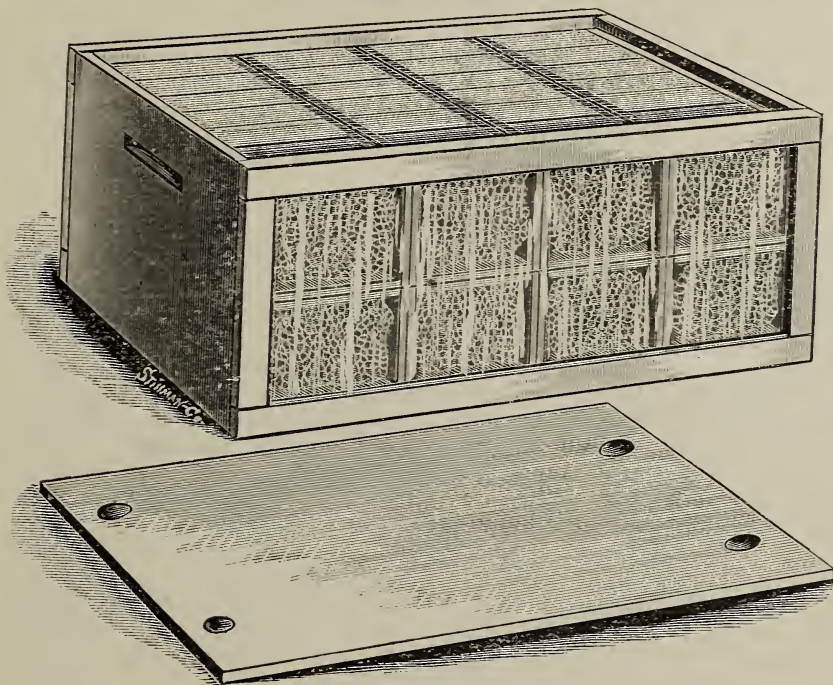
You see the hives would make the honey invisible, and of course the express men would smash it. Now, to determine about what sized package would be best, we sent to a manufacturer of fruit and berry crates, for they have determined by much experience, what is probably best. We procured a very pretty crate from Batterson of Buffalo. It is strong, light, cheaply made and has convenient handles to lift it by. From this we decided that we wanted a package composed of about 2 sections in height, 4 long—just as they stand in the hive—by 6 wide. This would make just 48 sections, and they weigh just about as nearly a pound each, as they can well be made to do. The engraving given on the opposite page will, we trust, make all plain.

The glass is to slide in at the upper edge, after the box is all made. If a glass should be accidentally broken, one may be easily slipped in by simply unscrewing the cover.

The end boards are of $\frac{3}{4}$ stuff, $9\frac{1}{2}$ inches wide, by 12 long. They are rabbeted at both upper and lower edge to let in the tops and bottoms, which are of $\frac{3}{4}$ stuff. The ends of the end boards, are also rabbeted just enough to receive the glass; this is done by a single saw cut. Strips of $\frac{3}{4}$ stuff, $1\frac{1}{2}$ wide, are put across above and below the glass; they reach below and are nailed into the bottom board to give it strength. The case

anywhere for about 12 cents, and we have all the advantage of glassed boxes, with less than $\frac{1}{4}$ of the expense, for nothing can be handier for a retailer, than to set this case on the counter and simply raise the cover and hand out the neat little 1 lb. sections to his customer. The case itself, filled, is about the best advertisement one can possibly have, and the contents are always free from dust, and secure from flies. No glass is needed on the sections, for they are so small and thick through, that they can be safely wrapped up in a piece of paper.

After we had finished the first case, it was



CASE FOR STORING AND SHIPPING HONEY.

is completed, by nailing strips of the same kind on the ends of the end boards, and it is then ready to slide in the glass. To have them look neat, they should be well painted before the glass is put in. Ours were so much admired before painting, that we anticipated an additional surprise when they were all painted a pure white, but we were somewhat astonished to find that the honey looked several shades darker by the strong contrast. Will some of our feminine friends who have a taste for appropriate colors, tell us what shade to paint our honey cases? White is objectionable, aside from the reason mentioned, because it soils too easily.

The two sheets of glass can be purchased

sent as a sample, with the remark that we thought the honey should retail for 25 cts. per lb.; this is their reply:

The case of honey was received to-day, and was unexceptionally in the best shape of any honey we ever saw for retailing. We had no trouble to get the price, 25 cents at wholesale, closing out the entire 45 lbs. net. We will say you may send us all you have of such honey in same shape. We will either buy it or sell for you as in times past.

It will not be well to crowd it on account of the outside cases or else we would say send all you have at once. If you have a ton or two it will not matter, only we would say send about 500 lbs. at a time, which could be sent by freight if it could be transferred at Grafton with care. STAIR & KENDEL.

Cleveland, Ohio, July 7th, 1877.

Honey put up in this shape will be pretty sure to sell readily in almost any town in

the U. S., and nothing further remains for us to do, but study how we can get it in this shape cheapest.

KEEP YOUR HONEY CLEAN AND FREE
FROM STICKINESS.

Do not take a single section from the hive until every cell is sealed, and the honey clean and dry.¹⁹ Each one should be as clean and perfect as a newly laid egg, and there is no trouble about having them so, if you do not yield to the temptation to take any that are *almost* finished. Just as surely as you send cases to market with the honey dripping and daubing every thing it touches, just so surely will you have to take up with an inferior price for your crop; do not rest satisfied until you can show as nice goods in your line as any other person in the business. You will get along just as fast, by keeping everything neat and tidy. If you should be so awkward as to get some of the comb broken and the honey running, just place all the leaky sections in a hive for a half hour, and the bees will empty all broken cells and clean up better and with more economy, than *you* could ever do it.

Lest this notice should induce a great many to write to Messrs. Stair & Kendel to sell their honey, I would remark that it will be of no use probably, unless you have something in small sections of about one pound each, and put up as neatly and nicely as I have described. Nice comb honey in boxes is quite plenty at 15 cents, in many places.

In order to test the shipping qualities of our cases, as well as the markets in our different cities, we sent a case, such as we have figured, to Cincinnati, one to Chicago, and one to New York city. They had no protection at all, but all went safely; and I know of no reason why a glass case of honey should not have as careful treatment as a basket of peaches, or a crate of strawberries, for that matter. All praised the case

and honey, some of them extravagantly, and most of them wanted more. It is so clean and convenient for retailing that a brisk demand has sprung up at home, and it looks now as though we might sell a ton or more right in the apiary, without stirring a "peg" to hunt up a customer. My friends, we can sell our honey, our queens, aye, and our bees too, all in this very way, if we will keep fully up to the light we now have. Throw away patents, adopt one uniform hive, honey package, etc., and let those who choose to follow the old jumbled up way of doing things hunt for customers, and sell at half price even then.

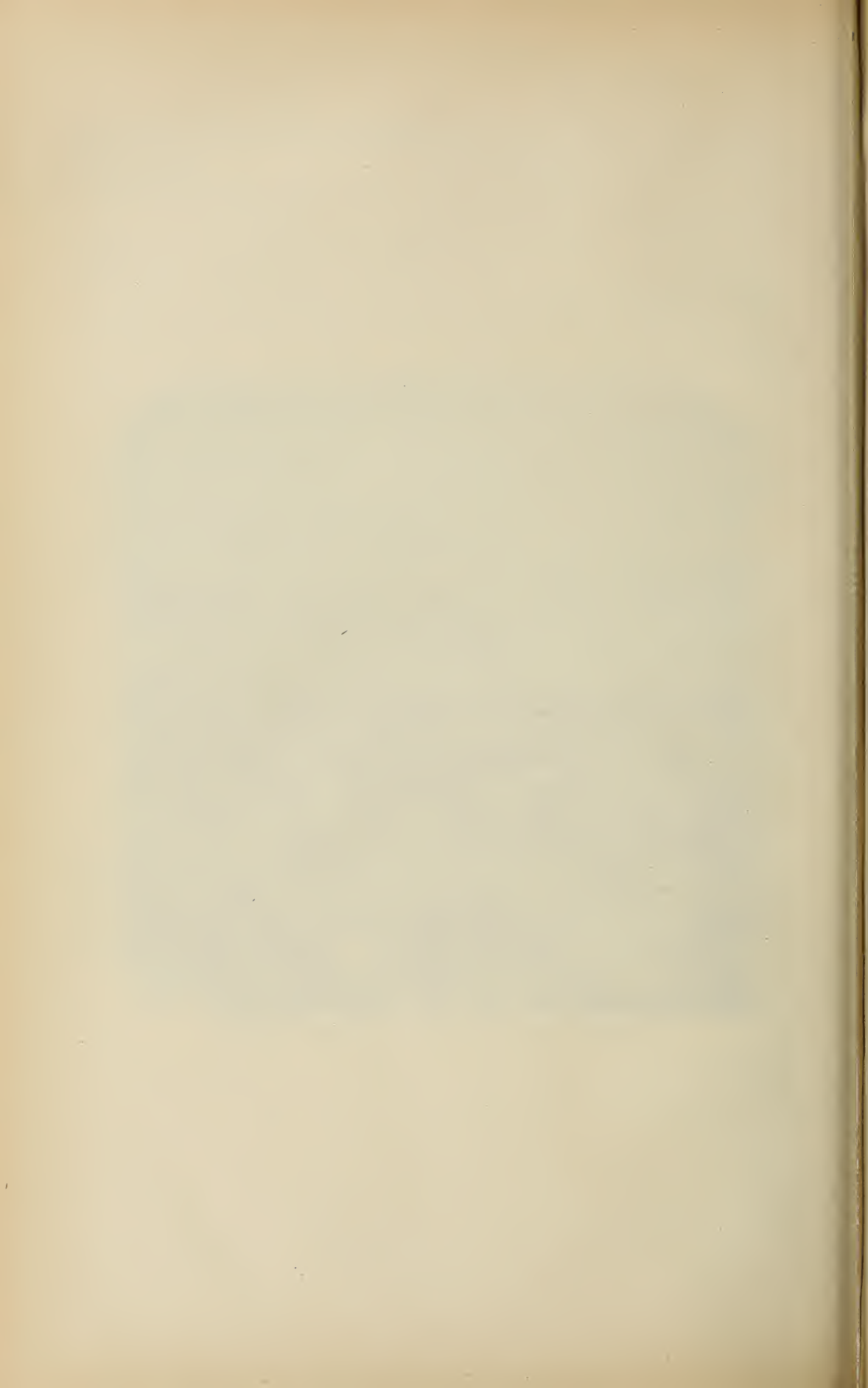
A similar case, but holding only a single tier of sections, is shown on page 109. This is made to go into the hive and therefore answers the double purpose of a case for holding the sections in the hive, and also a case in which to send them to market.

KEEPING COMB HONEY.

It is sometimes desirable to keep comb honey for a better market, or that we may have a supply the year round, etc. Well, to keep it with unimpaired flavor it must not be subjected to dampness. If water condenses on the surface of the comb, it soon dilutes the honey, and then it sours, etc. On this account the honey should never be put into a cellar or other damp room. Better put it upstairs; and that there may be a free circulation of air, without admitting bees or flies, the windows should be covered with painted wire cloth. We are accustomed to keeping comb honey the year round, and rarely have it deteriorate in the least. The same remarks will, in the main, apply to keeping extracted honey. During damp and rainy weather, the doors and windows to the honey-room or honey-house should be closed, and opened again when the air is dry.



J. ARCHER'S BEE RANCHE, SANTA BARBARA, CALIFORNIA.



D.

DANDELION (*Taraxacum*). This plant, I am inclined to think, is of more importance than is generally supposed; for it comes into bloom just after fruit blossoms, and as it yields both pollen and honey, it keeps up brood rearing, when it is of the utmost importance it should be kept going.²⁰ I do not know that it would pay to raise a field of Dandelions expressly for the bees, but as they grow to a great size and luxuriance when allowed to stand and blossom in the garden, I feel pretty sure that a cultivated plat of them would furnish a great amount of honey. What a pretty sight it would be on our honey farm. They do not ordinarily blossom until the second season, but perhaps, like catnip and clover, they would do so, if sowed early and cultivated. As Dandelions seem to be much on the increase in the fields and about the roadsides in our vicinity, I think we can safely conclude that the more bees there are kept, the more such plants we shall have; for the bees, by fertilizing each blossom, cause them to produce an unusual amount of good sound seed. I do not think of any other purpose for which the Dandelions can be used, except as greens in the spring; if we allowed stock to forage on our yellow flower garden, I am afraid it would mar its beauty, if not its usefulness for honey.

I really cannot say much in praise of the Dandelion honey, for we extracted some that we called Dandelion on account of the taste, and we could not use it at all. It was so dark colored and strong, that we with difficulty gave it away. The honey *may* have been from the shell bark hickory, however, as that comes in bloom at about the same time.

DISEASES OF BEES. I am very glad indeed, to be able to say that bees are less liable to be affected with disease, than perhaps any other class of animated creation. It is perhaps because the individual

members of a colony are so constantly giving way to other younger members, as they are hatched out, and come on the stage of action. Nothing but a really contagious disease could do very much harm, where vigorous and youthful members are being added to the family circle almost daily, and, for a great part of the year, by hundreds or thousands. Therefore, if your bees lack thrift, all you have to do is to start brood rearing briskly, and if the queen is in any way at fault, you can simply remove her and substitute another, without even so much as disturbing the regular daily routine.

So long as this is the case, we have little to fear from any disease that does not attack or interfere with the brood or young hatching bees. Luckily we have but one such disease. This is termed FOUL BROOD, and the subject will be found fully discussed under that head. The disease next in importance is DYSENTERY, and many seriously doubt whether this should be called a disease at all, unless, forsooth, we should say a boy had some disease when he ate green apples, or went about with his feet wet on a bitter cold day. The difficulty seems nearly allied to what, for want of some better name, has for the past few years, been termed,

SPRING DWINDLING.

In olden times, and up to within the past ten years, bees seldom died with honey in their hives; and when it was announced that good colonies of bees were gone, leaving their combs filled with honey, many were incredulous. Very soon, however, some of our best bee-keepers began to lose in the same way, and ere long, whole apiaries of hundreds of colonies were swept off in a few weeks, during the months of Feb., March, and April. If I am not mistaken, as soon as the bees began to get new honey from fruit blossoms or other sources, they began to build up, and then everything

went along as usual. The blame was first thrown on the extractor, because some bees died in hives from which the honey had been extracted, and others in the same apiary that had their combs left undisturbed, came through healthy as usual. This undoubtedly made a difference, for the honey gathered in the fore part of the season is often more wholesome than that gathered late in the fall; but it was by no means *all* the trouble, for apiaries having only box hives were in many instances devastated entirely. Exposure to the weather was suggested as the cause, and fine wintering houses and cellars were constructed, and for a while everything seemed prosperous; but very soon they died in these repositories also, the bees coming out on the floors in the dead of winter, besmearing their hives, and deporting themselves in almost any but a satisfactory way. Some succeeded so well with bee-houses and cellars, that they have all along adhered to them; but so have others with out door wintering; and in many localities, bees have wintered under almost all circumstances, if only supplied with plenty of food.

In a great majority of cases, it has seemed pretty conclusive, that the trouble was caused by bad food; the Italians may have been somewhat to blame for this, for during unfavorable seasons, they stored up large amounts of honey from the aphides or honey dew, or from other sources that bees are not usually wont to frequent. The use of the extractor has many times, without doubt, aggravated the trouble, as we have mentioned, where all the combs in the hive have been repeatedly emptied; for in such a case, the bees are driven entirely to the late gathered and often times unsealed stores, for their winter supplies. To remedy this matter, it was suggested that their honey be *all* extracted, and that they be wintered entirely on stores of a good quality of sugar syrup. This course proved successful, in the great majority of cases, but by the time we got well into it, the dwindling mania had partially gone by, and those that were left with their own stores, wintered all right also, so that very little was proven. Besides, it was a great deal of trouble, to do this feeding at a time when the bees were much disposed to rob, and so, it, like all the other remedies, was gradually dropped. This was especially the case when extracted honey became so cheap that it was no object to extract and sell it. Again, this bad fall honey that killed the bees one spring almost as surely as fly poison kills flies, if kept over until the next,

could be fed to them with perfect impunity. This may not have been always the case, but it was in some quite well authenticated instances. "Of course then it was a disease," said many, "and it is a disease that is catching too," said others; "for after it got among my bees, they 'jest all went'."

Well, my friends, I really do not know whether it was a disease or not, and I do not know that it matters very much. We learned pretty thoroughly, that whatever it was, it usually came in the spring just about the time the bees began to rear brood considerably, and that the old bees were generally gone, just after a spell of bad spring weather. Also that the very "baddest" honey, if I may be allowed the expression, did no harm at all, if fed in very warm weather. One more fact, and I am done. Colonies that were queenless, or that were by any means entirely prevented from raising brood, seldom, if ever, caught the—the "dwindling." I declare there is one more fact after all, that I had almost forgotten. It is that very strong colonies with tough old brood combs almost invariably pull through, especially if they have a good lively queen. Such colonies will stand like the sturdy oak, year after year, while the new stocks that are so rapidly built up, vanish like the smoke, from their new combs and small clusters of brood.

In view of the above facts, and after trying almost everything else, I began, at the suggestion of friend Townley of Tompkins, Mich., to experiment by making the bees fill their brood chamber, and surrounding them with chaff, brought up close to the bees.

My first experiment was made on a pretty strong colony. The chaff packing was about 4 inches thick, on all sides. These bees did not commence brood rearing as soon as the others, but about the time natural pollen appeared, they commenced to gather it briskly, and when fruit trees bloomed, they began to send a stream of hot air out at the entrance that would melt the frost in front of the hives after a cold night, for several inches. Do you suppose sudden changes of weather affected them? or that they caught the "dwindling"? Of course they did not; and what is still more cheering, I have had no case of dwindling in a strong colony thus prepared, although I have practiced the plan for the past three winters. Of course something may happen yet, to upset all the chaff experiments, as has repeatedly been the case with other things, but I feel pretty sure that a good chaff packing close to the cluster of

bees will do away with all the troubles we have experienced with cold and backward springs. With the chaff cushions and chaff division boards, you can very easily make the experiment on any colony that has begun to dwindle down just about the time they commence to rear brood. When I first stocked our house apiary, I was much taken up with the idea of having the hives simply covered with a single thickness of cloth, that we might more easily open and work with them. As the house was to be kept free from frost, I thought there would be no necessity of any other covering, even in winter; but I had the worst form of spring dwindling I ever knew, and lost every colony except a few that were in old tough thick combs. The next winter I prepared them just the same, but placed heavy cushions of chaff, at the sides and above the bees. They all wintered without a particle of dwindling, and by pushing ones hand under the cushion, directly over the bees, it was found to be as warm as if you were touching a living animal. Now all this heat, the winter before, had been passing off into the air, almost as fast as the bees generated it. Do you wonder their little bodies were exhausted in the attempt to rear brood and keep warm, and that they "got sick?" See WINTERING.²¹

OTHER DISEASES.

I believe I do not know any other, unless it be one that I can give no name for. It afflicts the bees in warm as well as cold weather, and the inmates of heavy hives, as well as weak ones. The symptoms are a sort of quivering and twitching motion, and finally the bee becomes so much emaciated that he looks like a shiny black skeleton of what a bee should be. I have seen bees thus affected, in perhaps a dozen or more colonies, but it all disappeared after a time, except in one colony. That one I broke up after it had become pretty well reduced, by destroying the queen, and giving the bees to other colonies. A neighbor has also lost a colony from the same trouble. I have noticed it more or less, for the last four or five years, but have seen it only in the two apiaries mentioned.

It may be well to mention that when a bee is crippled or diseased from any cause, he crawls away from the cluster, out of the hive, and rids community of his presence as speedily as possible; if bees could reason, we would call this a lesson of heroic self-sacrifice for the good of community. If your bees should get sick from some other

cause than I have mentioned, I would advise putting enough together to make a good lot, surrounding them with chaff cushions close up to the cluster, and giving them plenty of sealed honey also close to the cluster. If you have not the honey and the weather is cool or cold, use candy. If the cluster is small, give them a small piece at a time, right over the cluster, under the cushions.

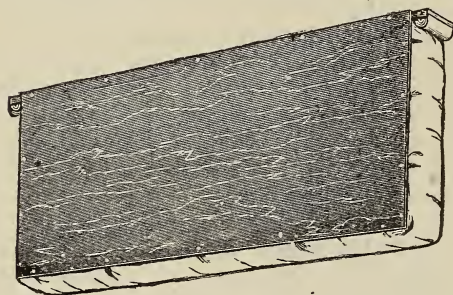
Weak colonies sometimes get a mania in the spring for destroying their queens; this can hardly be termed a disease, and yet the colony has become to a certain extent demoralized, and out of its normal condition, much as when they swarm out, as given in **ABSCONDING SWARMS**; they will generally come out all right if fed carefully and judiciously, as we have described. Bees are always prospering, when they are accumulating stores, and they are very apt to get astray in some way or other, when they are very long without some way of making daily additions to their "stock in trade," unless it is during the winter, when they are as a general thing mostly at rest. Almost all sorts of irregular vagaries may be stopped, by regular daily feeding, and I would advise the candy, for it furnishes both honey and pollen, if made with the addition of flour as we have advised.

DIVIDING. This term is usually applied to the operation of increasing the number of stocks, by putting half the bees and combs into a new hive, just about swarming time; it is really one method of artificial swarming. If you have an extra laying queen to give the queenless portion, it may do very well; but otherwise, it is a wasteful way of making increase, and has mostly been abandoned. If the bees are just ready to swarm, and have queen cells pretty well along, it may answer very well; but even then, it would pay better to take but two combs with the queen cell, and get a laying queen before making the actual division, as advised in **ARTIFICIAL SWARMING**.

DIVISION BOARDS. Make a frame of lath, precisely of the outside dimensions of the frame you use in your hive. As ordinary lath is 1½ wide, you will have a frame quite similar in appearance to the broad frames that hold the sections, except their being roughly made. When this is done, you are to tack stout cloth all round the sides and bottom as shown in the engraving, and as you tack it on, it is to be filled with chaff, so as to make a sort of soft cushion. You had better use duck for this purpose, as our

²¹During the present season of 1882, we have had reports of something quite similar, from several different localities.

division board may be required to stand some severe pulling, to tear it loose from the propolis, when it is to be removed. You will need to pucker or gather the cloth slightly at the corners, that they may not draw in when the board is finished. When this is done, nail securely on each side a thin board about 3-16 in thickness, filling in between the two with chaff. Now our board is finished when we have fastened a small roll of duck to each end of the top bar, to close the groove in the metal rabbet. To get this roll on securely and in neat shape, it is put on the top bar before it is nailed to the rest of the frame. The tacks that hold the outside end of this strip of cloth, are driven into the end of the top bar, and the cloth is then rolled over the heads so as to entirely conceal them; the other end, is nailed between the top bar and the end bar as, in fact, is the end of the long strip of cloth also.



CHAFF-CUSHION DIVISION BOARD.

This division board, if made of the proper dimensions, should fit nicely and easily, in any hive. It will stand securely where placed, fits air tight even if the hives should vary a trifle in size inside, and yet can be always taken out easily, because the chaff cushions are yielding. When used to contract the space of a small swarm or nucleus, it can be easily pushed up until the bees fill their apartment, and it leaves a warm smooth flat side toward the bees. I prefer the board side to cloth, because if combs are built beside it, they are always smooth and flat, and the bees can never bite through the board, as they will in time through even duck, when used for a division board. If you wish to use them for dividing two colonies in the same hive, the division is perfect, and no bee ever gets round or over them, to kill a queen in the other apartment. But the principle use of these boards, is to fix an ordinary hive for out-door wintering. For this purpose, we put one against each outside wall of the hive; if the colony is not a full one, push them toward each other until it is a full one on a smaller scale, put your chaff

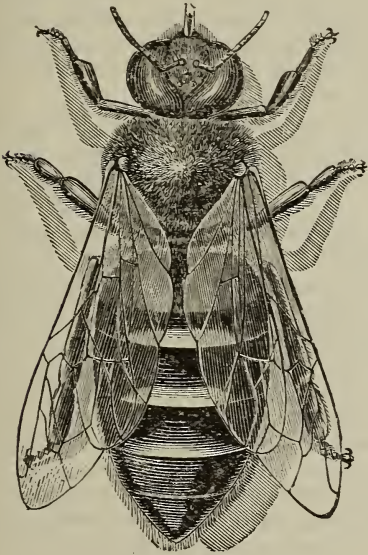
cushion on top, and they are in a very good winter nest.

If you wish to feed a nucleus so as to build comb and raise brood in cool fall weather, you can do it nicely, using these division boards. Place one on each side of the bees up to one side of the hive, and feed liquid food in the empty part, by means of the wooden feeder. Have the apartment for the bees contracted so that some will be crowded out around the entrance, and fold a sheet of duck so as to perfectly close the space above the frames. Get them to wax it all tight with propolis if they will. They will soon find the way to and from the feeder, by passing round the lower corner of the division board at the entrance of the hive, and as the warm air can in no way escape, they are to all intents, getting their honey from outside. With such an arrangement in Simplicity hives, I have been building colonies up beautifully during the present month of Oct., (1877) and by feeding nothing but a syrup made of grape sugar. Where the space was contracted so as to "squeeze" the bees out at the entrance, except when very cool, I have succeeded equally well, with but space for three frames.

DRONES. These are large noisy bees that do a great amount of buzzing, but never sting anybody, for the very good reason that they have no sting. The bee-keeper who has learned to recognize them both by sight and sound, never pays any attention to their noise, but visitors are many times sadly frightened by their loud buzzing. We will commence as we did with the worker bees, at the egg, and see how much we can learn of these harmless and inoffensive inmates of the bee hive.

If our colonies are prosperous, we may find eggs in the drone comb of some of the best hives as early as March, but not, as a general thing, until April. You can tell the drone cells from the worker at a glance, (even if you have never seen them) by the size, as you will see by looking at HONEY COMB. Whenever you see eggs in the large cells, you may be sure they are drone eggs. I do not mean by this that the eggs that produce drones look any different from any other eggs that the queen lays, for in looks they are precisely the same. They are almost the same in every respect, for the only difference is that the egg that produces the worker bee has been impregnated, while the others have not; but more of this, anon. The egg, like those producing workers, remains brooded over by the bees, until it is

about 3 days old, and then by one of nature's wonderful transformations, the egg is gone, and a tiny worm appears, a mere speck in the bottom of the cell. This worm is fed as before, until it is about a week old, and is then sealed over like a worker, except that the caps to the cells are raised considerably more; in fact they very much resemble a lot of bullets laid closely together on a board. They will begin to cut the caps of these cells in about 24 or 25 days; the caps come off in a round piece, very much like those from a queen cell.



DRONE BEE.

The body of a drone is hardly as long as that of a queen, but he is so much thicker through than either queen or worker, that you will never mistake him for either. He has no baskets on his legs in which to carry pollen, and his tongue is so unsuited to the gathering of honey from flowers, that he would starve to death in the midst of a clover field.

I presume the young drones are ready to leave their hive after they are about two weeks old, and they do this shortly after noon, of a warm pleasant day. They come out with the young bees as they play, and first try their wings, but their motions are far from being graceful and easy, and they frequently tumble about so awkwardly that as they strike against your face, you might almost think them either drunk or crazy. I do not know how we can very well decide how old a drone must be, to fulfill the sole purpose of his existence, the fertilization of the queen, but should guess any

where from three weeks to as many months.²² Perhaps they seldom live so long as the last period named, but I think they sometimes do. Many facts seem to indicate that they, as well as the queen, fly long distances from the hive—perhaps two miles or more. We have now satisfactory evidence that the meeting between queens and drones takes place not very high up from the ground. Several observers, during the past season (1878), have reported having seen this meeting not very far from the hives, during the swarming season. The queens and drones both sally forth during the middle of the day, or afternoon, and in from fifteen minutes to an hour, or possibly a couple of hours, the queen returns with an appendage attached to the extremity of her body, that microscopic examination shows to be the generative organs of the drone. These facts have been observed by hundreds of beekeepers, and are well authenticated. In attempts to have queens fertilized in wire cloth houses, I have, after letting the queens out, seen the drones pursue them until both parties vanished from my sight. Still another fact: if you take a drone in your hand some warm afternoon just as he has sallied from the hive, and press him in a certain way, he will burst open something like the popping of a grain of corn, extruding the very same organ we find attached to the queen, and dying instantly. It is generally conceded that he dies in the act of fertilization. The fertilization of queen bumble bees has frequently been witnessed, but although it is quite probable, it by no means follows, that the queens and drones of honey bees meet in the same way. Several accounts have been given, but as the drone and queen are only seen whirling about each other on the wing, there is much about it that still remains in obscurity. See QUEENS.

In the fall of 1876 I saw a swarm of black ants sporting in the sunshine. A close look showed them to be both males and females, and as pair after pair fell to the ground, I had ample opportunity of noting all circumstances. In this case the drones at first seemed paralyzed, but after the queens flew away, they revived and afterward flew away also. One point here particularly impressed me: the ants of both sexes were in such countless thousands, that they must have come from all the ant-hills for, I should say, miles around; the result was as you see, that there was hardly a possibility of insects from the same family meeting. Now is there any other way in which the strain of

blood could be so effectually crossed with that of some distant colony, as by this huge jubilee of both sexes?

Queen ants, like queen bees, seldom if ever come out of their homes at any other time, and, as if by some preconcerted arrangement, they meet and mix up apparently for the very purpose of effectually preventing "in and in breeding," as it is usually termed when applied to stock. Do queens and drone bees, meet in the same way, in vast numbers? Many circumstances seem to indicate they do, yet it, like many other things, lacks positive proof. Drones have been seen in out of the way places, in larger numbers than we would think could possibly come from one hive, and many have heard their loud humming, who have not seen them. The fact that a queen should become fertilized in so short a time after leaving the hive, seems strange, unless it really is a fact that she is called to the swarm of drones by their loud humming, (which she would instinctively recognize from a long distance) flies among them, falls to the ground and tears herself loose from her dead mate by her strong limbs, and then returns to her hive, having been absent only a few minutes. I have ventured to theorize thus much, hoping that our friends will aid in corroborating or controverting, as the case may be, the deductions as given above.

One of the most wonderful things about the drone or male bee is that it is hatched from an egg that is unimpregnated. So wonderful indeed is this, that the matter has been for ages disputed, and is even now, by many who have not looked into the matter and examined the evidence. What we mean by unimpregnated, is that queens that have never met the male bee at all, will lay eggs, and these eggs will hatch, but they always produce drones, and never workers. Those who have had the care of poultry, are well aware that the hens will lay eggs right along, if no cock is kept in the yard at all; and if I am not mistaken, a pullet would commence and lay perhaps nearly her usual number of eggs, if she had never seen a male bird. Now, nearly the same is true with regard to the queen bee. If she fails to meet a drone during the first 30 days of her life, she usually begins to lay eggs, but she seldom lays as many, or with the same regularity, as a fertile queen. The eggs the hen lays, if she is allowed to sit, never produce any chicks at all. The eggs laid by the queen, under the same circumstances, as I have said before, always produce drones.

There is one more fact connected with the common fowl: if the male bird is put into the yard with the hen for one day only, good fertile eggs will be laid for many days, possibly a whole laying. If a black Spanish cock should get among a flock of white hens for only a single day, all the eggs laid for many days afterward will produce chicks with more or less black feathers on them. I give these statements from actual facts. The point I wish you to observe, is that the eggs of even the common fowl are fertilized as they are laid by the hen, or possibly a few days before. With the fowls, one meeting with the male bird suffices for the fertilization of an egg daily, for a week, or more; with the queen bee, for her whole life of three or even four years.

I do not know whether the hen has the power of laying fertile or unfertile eggs at will, or not; perhaps not; but I do know that a queen bee lays both fertilized and unfertilized eggs, alternating from one kind to the other in rapid succession. Skillful microscopists have carefully dissected eggs from worker cells, and found the living spermatozoa in numbers from one to five. These living spermatozoa were precisely identical with those found in dissecting a mature drone. Again: every egg a queen lays, passes a little sack containing a minute quantity of some fluid; the microscope shows that this fluid contains thousands of these spermatozoa. Is it not wonderful that these spermatozoa should live four years or more in this little sack, awaiting their turn to be developed into a higher life whenever they should be required to fertilize the egg that is to produce the worker bee? Very well; now the egg that is taken from a drone cell contains no trace of spermatozoa. Therefore it, like the egg of the common fowl, unimpregnated, should never hatch. But, my friends, it *does* hatch, and produce the drone. The first glimpse we get of the little bit of animated nature, is the tiny speck alive at the bottom of the cell. Does he grow out of nothing, without parentage, at least on the paternal side? If his mother was an Italian, he is also Italian; if a black queen, he is also black. We shall have to conclude, perhaps, that he is the son of his mother, and nothing more. The egg that has never been impregnated in the usual way, must, after all, have some living germ incorporated in its make up, and this germ must come only from the mother. The great skill and proficiency with the microscope, required to make these minute examina-

tions, is such, that but one or two have ever succeeded in exploring as far as I have mentioned, and it is somewhat like our investigations in the polar regions. Who among us will educate himself for the work and carry it along?

Drones are also hatched from eggs laid by worker bees. These drones are smaller in size than those from a queen, and the question as to whether they are capable of fertilizing queens, so as to be of some value, like other drones, is one that I believe has never been decided. Some facts have been brought to light that seem to be pretty good evidence on both sides of the question, but so far as I know, nothing very definite. I confess, that I would not want to make use of them, even if they were good, for I want the strongest, healthiest, and largest drones I can get. For a further account of the mothers of these queer drones, see FERTILE WORKERS.

After what I have said, you will perhaps see how clear it is, that the drones are in no way affected by the fertilization of the queen; or, in other words, that all daughters of a purely fertilized Italian queen, produce drones absolutely pure, whether they have been fertilized by a black drone or not.

Until quite recently, we have had no easy way of repressing the production of drones in far greater numbers than could ever be desirable. Since the introduction of the fdn., however, it is quite an easy matter to make almost every cell in the hive a worker cell. On the other hand, if we choose, we can have a hive filled entirely with drone comb, and a good queen could, I think, be induced to raise nearly, if not quite, a full peck of drones at one time. By this means we can have our drones raised from such stock as we choose, and we can save the vast amount of honey that has so long been wasted by rearing and feeding drones that we do not need. While extracting, I have found as many as several pounds of drone larvæ in a single hive; and, to save the honey they would consume as soon as hatched, we used to shave their heads off with a very sharp knife. This is certainly rather expensive business, for it must take more than a pound of honey, to say nothing of the value of the pollen, to get up a pound of sealed brood. If all this labor and material had been utilized in the production of worker brood, it would doubtless have been equivalent to a swarm of bees. All worker comb would have insured this without trouble.

It is quite probable, that all the drones

will be raised that can usually be required, without making any special provision for them; but still, it may be a good idea to devote one hive, in an apiary of 50 or a hundred colonies, to the production of choice drones.

REARING DRONES OUT OF SEASON.

This is quite a difficult matter to accomplish, especially in the spring; and although we have many times fed colonies with this end in view, we have always found some other colony that would have drones flying just as soon, without any artificial aid. Drones may be kept almost any length of time, by making the colonies containing them queenless, or by putting them into queenless colonies. During warm dry weather in the summer or fall, drones may be procured by feeding, but the feeding must be regular, and given every day for several days or weeks. By feeding one colony a barrel of sugar in the fall, I succeeded in getting a nice lot of drones in October. Of course their combs were taken away and empty ones given them, to give the queen room. Before we can get drones, we must get worker brood under good headway, and then, if we put a drone comb right in the centre of the brood nest, the queen will, if all things are favorable, begin at once to fill it with eggs. The feeding must be kept up, however, for bees are very easily discouraged, and if a stoppage occurs in the daily supplies, they will not hesitate to pull the young drones out of their cells and sacrifice them without mercy.

DESTRUCTION OF DRONES IN THE FALL.

This does not necessarily occur in the fall, but may take place at any time in the summer; and I have several times known the drones killed off between apple bloom and white clover, only because supplies ceased, causing the bees to become discouraged and give up swarming for the time being. I know of no way in which you can tell so well that the yield of honey has ceased, as by the behaviour of the bees to their drones. When, in the midst of the honey season, you see a worker buzzing along on the back of a drone who seems to be "scratching gravel" to get away from the hive, you may take warning that the yield of honey is falling, and that you had better stop making artificial swarms and prepare for feeding, if it is your intention so to do. I do not know that I ever saw bees sting drones, but they sometimes pretend to do so; I rather think it is only a feint to drive them away. The poor drone, at such times, after vainly trying to

go back into the hive, will sometimes take wing, and soar away off in the air, only to return after a time to be repulsed again, until, through weakness perhaps, and want of food, he flutters hopelessly in the dust, and so submits to the fate that seems to be a part of the inexorable law of nature, and of his being.

To preserve drones for late queen-rearing, I have been in the habit of carrying all frames containing drone brood, to some queenless hive, knowing they would be safe there as long as wanted, even if it were all winter. I believe drones have been, under such circumstances, wintered over; but whether they are of any value in the spring or not, I am unable to say; I should fear they would not be by the time queens could be reared. We usually have drones in some of our colonies, as soon as April, and that is as early as I should care to undertake to rear queens, in ordinary seasons. I have several seasons reared queens and had them successfully fertilized, even after all the drones had been gone some time, so far as I could discover, and as they proved to be purely fertilized, I have been not a little perplexed. Is there a possibility that by some *other* strange exception to the rule, a queen *may* lay eggs that will produce workers as well as drones, without being fertilized? If such is the case, it will account for the rare instances in which queens hatched with imperfect wings, lay eggs that produce worker brood. We know that aphides and some other insects, reproduce their species without any agency of the male, for several generations. It is of no use to say we do not believe it, for the evidence is indisputable. How wondrous are thy works, O Lord!

DRONES WITH BRIGHTLY COLORED HEADS OF DIFFERENT COLORS.

This is a queer feature in natural history. Almost every summer some one writes or sends us specimens of drones with heads of different colors. The matter has been reported and commented on several times in our back numbers. Not only do we occasionally find drones with white heads, but we find them with heads of a cherry-red color; again, of a bright green, and at other times yellow. I confess there is something very wonderful and mysterious to me in this matter. Why queer old dame Nature should decide to single out the heads of drones to sport with in this way will, it seems to me, be a pretty difficult matter to explain. Why should this peculiarity show itself in the drones more than in the queens and workers? Again,

why should *heads* be the subject of these bright rainbow colors? Is there really any purpose or design in it? or is it just because it *happened* so? I presume there are very few among our readers but will say there is a purpose and a design in it; and the next thing is to decide why it should be so. Here is a question for scientists.

A singular fact in regard to this matter is, that we find many of these colored drones in one hive; that is, where you find one red-headed drone in a hive, you will probably find more; and a queen that produces them once will do so again. If I am not mistaken, I have seen hives where all the drones were colored in this strange way; and their heads were all alike — of one color.

DYSENTERY. When you see your bees covering the door-steps and entrances to their hives with a yellowish, disagreeable looking excrement, you may say they have the dysentery, or what is usually known as such. If the weather becomes very warm and pleasant, they will usually get over it, after they have had a full flight. If, on the contrary, the symptoms show themselves before warm weather, and no opportunity is given them to fly, they may get so bad as to cover their combs with this substance, and finally die in a damp filthy looking mass.

CAUSE OF DYSENTERY.

I believe the most common cause is bad food, coupled with an open, cold hive, with a small, or insufficient cluster of bees. I can hardly think any food alone would produce the disease, because we rarely, if ever, find the bees suffering from anything they will gather, in warm summer weather. Honey gathered from rotten fruit, if we may call it honey, is very productive of this complaint, and cider from cider mills, is almost sure to kill bees at the approach of cold weather. See CIDER. I knew a lady who boiled up a mash of sweet apples and fed to the bees, because they were short of stores, and she could not afford to buy sugar for them. They all died of dysentery, long before spring. Where dampness accumulates from their breath, and settles on the combs, diluting the honey, it is very apt to cause these symptoms. Sorghum syrup has brought on a very aggravated form, and *burnt* candy or sugar is almost sure poison to bees, although it may be fed them with impunity in the middle of the summer. The burnt sugar, or caramel, attracts moisture from the air very rapidly in damp weather, and I am inclined to think it is this moisture that produces the disease.

While it is very certain that no such symptoms are found in warm weather, it is also certain that a strong colony in a hive with soft, warm, dry, porous walls, will stand an amount of bad food, that a weak one, or one exposed to drafts of cold air, will not. I have known bees having considerable stores of cider, to winter very well, if the colony were strong enough to keep the whole interior of the hive, dry and warm. A powerful colony, if left with their hive uncovered during a rain storm, will soon dry themselves, and while they are doing this, they remind one of a sturdy cart horse, as he shakes the water off his hide and dries himself by his internal animal heat. While they have the health and numbers to repel moisture in this way, they are safe against almost anything. But to help them to keep this internal strength, they should have close and comfortable quarters, very much such as you would need my friend, to enable you to pass a severe winter's night, in health and comfort. The hives often used, are so large and barn-like, in respect of the winter's brood nest, that comfort is almost out of the question, for it does little if any good to pile straw corn-fodder &c., over the outsides of the hives, while the cluster within has no sort of protection at all. If they were in a hollow tree, the diameter of which was so small that they could fill it completely, they would be in a much better place, especially, if the sides were lined with soft dry rotten wood. I have seen icicles nearly as large as my arm, in box hives that were tight and large; these had all formed from the condensation of the breath of the bees. Now, should they melt during a thaw, in such a way that this water would run down on the bees and their unsealed stores, it would be very apt to produce unhealthiness, to say nothing farther.

PREVENTION OF DYSENTERY.

From what I have said, you will probably infer that I would make the swarm larger, or the hive smaller, during the winter season. If we say also, have the walls of the hive of some warm porous material that will absorb moisture and afterward dry out readily, you have the idea so far. Perhaps the chaff cushions and DIVISION BOARDS are the readiest means at our command of accomplishing this.

While they may get along on almost any kind of food when thus prepared, I would by no means fail to give them good wholesome stores, as far as possible. Honey gathered in the middle of the season is generally

wholesome, for by the time winter comes, it is thoroughly ripened, by the same drying out power I have spoken of. Honey gathered in the fall, if sealed up, is generally good, but some of the fall flowers produce a honey that seems to separate into a thin watery liquid, and a granular substance, something like candied honey. I am not quite sure this causes dysentery, but it looks in some seasons very much as if it does. A syrup made of white, or whitish sugar, I believe is always wholesome, and when bees are short of stores, it is probably the cheapest and safest of anything we can feed late in the fall. We have had one report of the new grape sugar seeming to indicate that it might be productive of dysentery, but it has answered so nicely in our apiary, up to this date, Jan. 15th. '79, that I am inclined to think the quality of the sugar was not quite like that we use.

I once wintered a colony, on sugar stores, that came out so healthy in the spring, that they did not even spot the white snow visibly, when they voided their excrement at their first flight in the spring. This, I believe we may consider perfect freedom from any sign of dysentery. A friend who is an old time, box hive bee-keeper, says it is the pollen that makes them spot the snow; that if they are wintered without pollen, they will make no perceptible spot. I think there may be some truth in this, for those wintered without pollen seem to spot the snow but little. Spotting the snow is not always an indication that we should be alarmed, especially if the bees seem to rise without trouble, and get back to the hive in safety; but should they soil the entrance and inside of their hives, and then fall around the entrance in considerable numbers, unable to take wing, it is pretty safe to say, that without very warm fine weather, they will soon be demoralized and broken up.

CURE FOR DYSENTERY.

Summer weather seems to be a sure and certain cure. One day of summer weather, or a day warm enough for them all to fly freely is, I believe, a cure usually; especially if they are provided with wholesome food and tucked up warm, after they have had this fly.

The question now comes up, can we not give them this needed fly by artificial means? It has been done, many times with success, by taking the hive into a warm room, and fixing a square frame of thin cloth or netting over it, in which they can fly and empty themselves. This frame

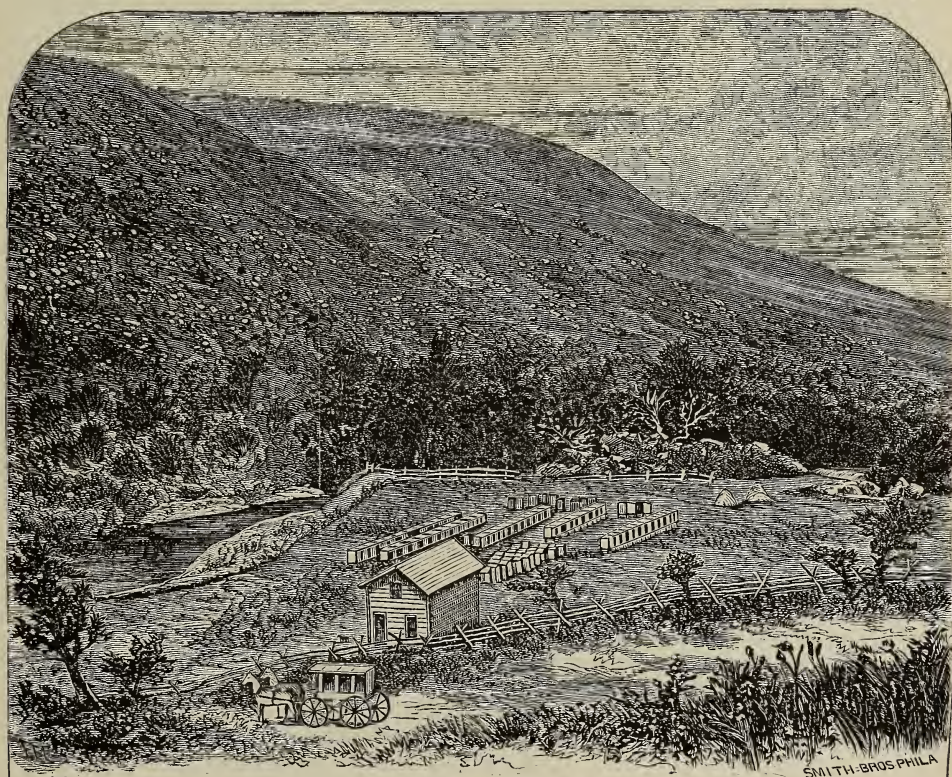
should be about a yard square. The room should be light and warm. After they are through, the temperature should be allowed to fall, until they are driven back into the cluster on the frames. To avoid soiling the hive and combs, papers may be spread over them, only allowing an opening for the bees to come up into the cage. This is a troublesome and disagreeable task, and I think will hardly pay, unless it is with a few hives, or to save a very valuable queen. A beginner is very apt to be alarmed, when there is no trouble at all, and I repeat, unless the bees are soiling the combs in the hive, and getting themselves soiled, damp, and demoralized, I would let them alone (after tucking them up with chaff cushions) to take their chances until there comes a warm day. I know of a beginner who, on looking into his hive and finding only a small cluster away down in the combs, imagined they were nearly all dead, and hearing through the Journals of giving them a fly in a cage, took the innocent and unoffending bees into the house, and warmed them up. The little knot of bees began to unfold under the influence of the warmth, and turned out to be a good-sized colony. They had packed themselves down into a little sphere, so small that an inexperienced person would have been likely, at first glance, to call them only a good-sized handful, but they were a good swarm, and were in just the shape they should be to stand a zero freeze, or rather they had done the very best they could do in a winter brood nest four or five times as large as they really needed.

If the trouble is caused by bad honey, and this is many times the case, they should be removed from their combs, after their flight, and supplied with honey which you know, or have reason to think, is good, well ripened, and wholesome. Every bee-keeper should have a stock of such combs on hand for emergencies. They can be taken from the hives during the yield from clover or linden, in July or Aug. If you cannot get these, I would give them candy, a small lump at a time, just over the cluster, the bees of course being on empty combs. 'Tis

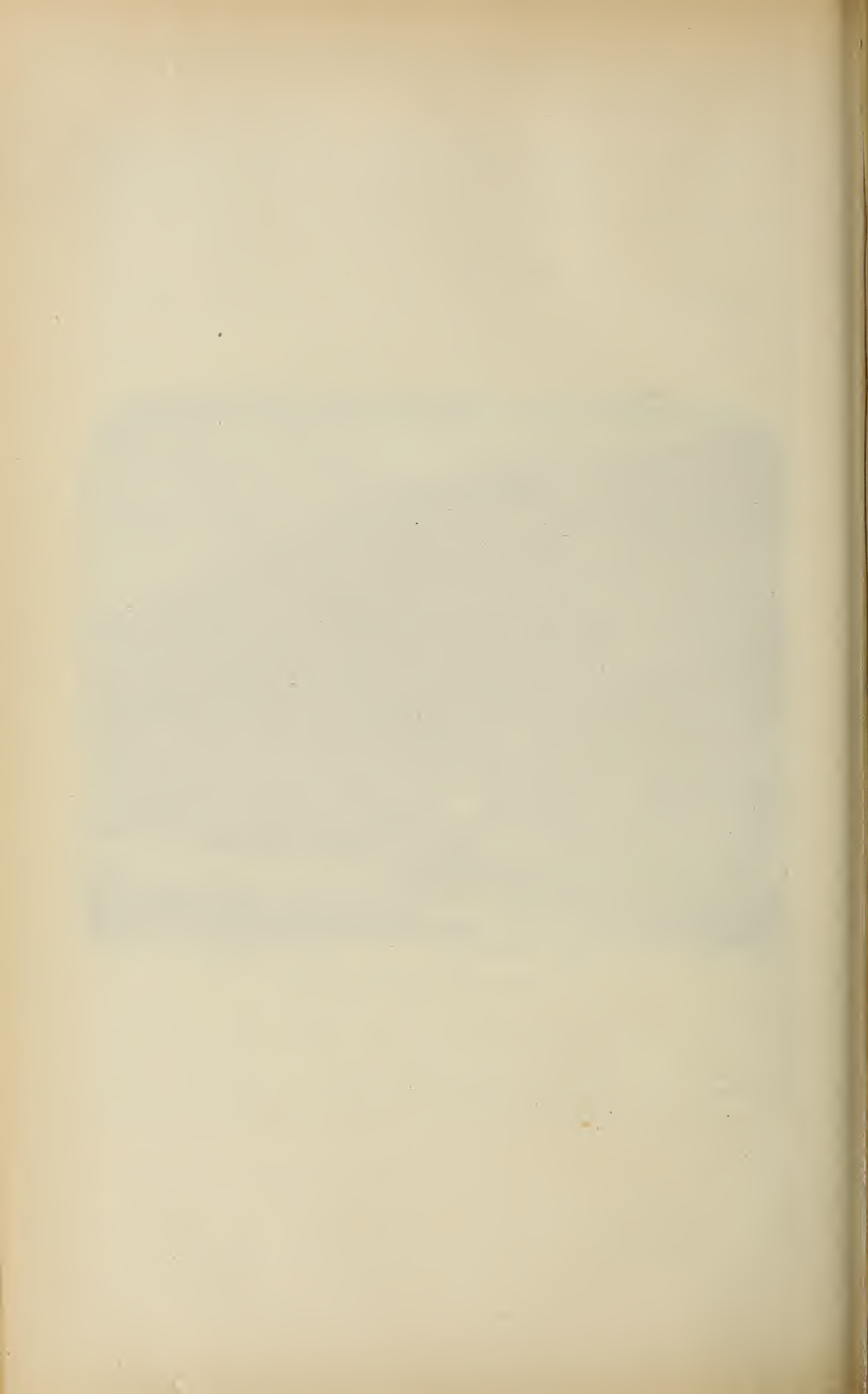
rather risky I know, for after the bees have become diseased as I have mentioned, they seem to be discouraged, and to have lost all heart to do anything. I have known them to starve with candy or honey close to them, at such a time. If you can stir up some ambition in them, and get them to clean off their wings and "plumage," and go to work, there will be no trouble, but so long as they preserve that listlessness and indifference, there is but little hope for them; they will probably swarm out on the first warm day, if you do "tinker them up." If the season is pretty well along, say April or May, you can often stir up their ambition, by giving them a little unsealed brood from another colony. The old adage, that an ounce of prevention is better than a pound of cure, will apply most emphatically to dysentery. It may be that we *cannot* always *prevent* dysentery, for some cases seem rather difficult to account for, but I think we can in the great majority of cases.

THE AGENCY OF THE APHIDES IN PRODUCING DYSENTERY.

Perhaps the most productive cause of dysentery is the honey from the APHIDES; or at least most complaints have been made of this honey. As bees seldom touch this, except during drouths or unfavorable seasons, it is quite likely it has been the cause of much of the mischief. If the early honey is all extracted from the brood combs, and the bees left with nothing but this bad honey, gathered late in the fall, the matter is much worse; and many cases have been reported, of colonies dying where the extractor had been used, while those untouched had been free from the disease. The moral is, refrain from extracting too closely from the brood apartment. I would, at least, let the bees fill their brood chamber with clover or linden honey, just before the yield ceases, extracting toward the close of the harvest, only from the combs in the upper story, unless you choose to feed them up for winter, on sugar or candy. We have had one or two favorable reports of wintering on the aphidian honey, from which we may conclude it is not always deleterious.



A CALIFORNIA APIARY, NEAR SAN DIEGO.



E.

ENEMIES OF BEES. These are, so far as I know, taking them alphabetically, ANTS, BEE-MOTHS, birds (KING-BIRDS), mice, parasites, skunks, TOADS (and frogs), and wasps. Perhaps I should also add, wicked boys or men who have so little regard for the rights and faithful hard earnings of their fellows, that they sometimes steal hives, honey and all, just for the trifling amount of honey to be got from the mashed up ruins, which they generally make of the bees and hives. To be frank, I should add patent hive men; and these latter, so far as my experience goes, have been worse enemies of the bee than any I have yet enumerated. It has been said, and with much justice, that ignorant bee-keepers are the bee's worst enemies. If ignorance had coupled with it, wilful deceit and fraud, I do not know but that I should subscribe to the assertion; but as those who have been ignorant, are now very rapidly becoming educated and intelligent bee-keepers, I have much charity for them. The man who is persistently and wilfully bad, is not only the worst enemy of bees, but of all mankind, himself included; and of this class are the greater part of those who take money for their pretended inventions in bee hives. I am speaking severely, I am aware; but could you, year after year, hear, as I have, the statements of those who have taken up the pursuit with all honest enthusiasm, and hear them tell of how they have invested money and time, all in a wrong direction, of how they have been purposely kept in the dark in regard to what was really known about bees, of how they have been told that the bee-moth is the one great enemy, and that no one else has the secret of its banishment, I think you would agree that these land sharks in human form are worse enemies than all the moths, birds and toads combined, that ever infested the neighborhood of bee-hives.

Ants and bee-moths have been noticed already in their respective places; under the head of king birds, we shall mention what

is known of the depredations the feathered tribes make on bees.

MICE

Mice only do harm when they get into the hives, and this part of the subject has been sufficiently noticed under the head of entrances. It may be well to remark that mice sometimes make sad havoc among surplus combs, when stored away with small patches of honey in them. The combs will be completely riddled during the winter time, if they are left where mice can get at them. On this account, the honey house should be mouse proof; and for fear that a stray one may by accident get in, it is well to keep a trap ready baited with toasted cheese. If you have not a tight room, make a tight box, large enough to hold all the surplus combs which have honey in them.

PARASITES.

The only parasite we have ever seen, is the *Braula*, or Italian bee-louse, and we have never seen them except on bees just imported from Italy. I feel safe in saying no fear may be anticipated from them, if the bees are kept in strong colonies, and in clean tight hives, with no old refuse and rubbish accumulating about them. One or two reports have been received of bee-lice in our own country, but I think they were exceptions.

SKUNKS.

Skunks have been known to approach the hive at night time, and, by scratching on or near the alighting board, to entice the bees out where they could "gobble them up." It would seem a little strange that these animals have no fear of stings, but they, doubtless, are guided by a sort of instinct that enables them to divine how to get hold of the bee with its sweet morsel of honey in its honey sack, without receiving harm from the sting.

SPIDERS.

Spiders, and the method of repelling them, we have mentioned under ALIGHTING BOARDS and PORTICOS. They too, as well

as toads, seem to have a rare appreciation of a heavily laden bee as he returns to the hive; we should therefore be careful that all spider webs be faithfully kept brushed away from the hives, and that the hives have no corners or crevices about them, to harbor such insects. Be sure that there is no place which the broom will not clear out at one sweep, for where we have a hundred hives, we cannot well spend a great amount of time on each single one. The house apiary is quite convenient in this respect, and it gives me a fine appetite for breakfast, to go out bareheaded, and brush off every trace of a web, with such genuine good will that the poor spiders, as soon as they have recovered from their astonishment, with one accord, agree that the locality is an unhealthy one for those who believe in driving a thrifty business.

I am inclined to think that many of these so-called enemies only take up the destruction of bees as a chance habit, and that it is not always to be looked for or expected. Common fowls sometimes get a habit of eating their eggs, but it is so unusual an occurrence that we can hardly regard it as a matter of any very serious importance. It may be well, at times, to look out for the enemies that prey on bees, but, as a general thing, I think they are quite capable of fighting their own battles, if we give them the proper care and proper hives.

WASPS.

Wasps and hornets sometimes capture and carry off honey bees, but unless they should take part in the work in great numbers, I would have no solicitude in regard to them.

A large fly, called the bee-hawk, or mosquito-hawk, has been mentioned by our Southern neighbors, but it is said to be easily frightened away by opening a vigorous warfare with whips and sticks.*

THIEVES AND PATENT-RIGHT VENDERS.

Under APIARY, I have mentioned how we can protect our hives from the inroads of thieves, but I fear it will require something more than tight high fences, to protect beekeepers from venders of patent hives. I do not know a single patented feature on bee hives and implements (and there are hundreds and hundreds of them), that would come into general use if the patent were removed. Almost constantly, I am receiving descriptions and circulars of some patent hive, asking if I would advise investing in them, and although I have faithfully examined every thing that has come up, I find

them pretty much all alike; either wretched mistakes and blunders, or the work of greedy, unprincipled, bad men. Have nothing to do with them, and under no circumstances think of paying them money. No, not even if they are ministers of the gospel, as many of them claim to be; and some of them are, I presume, God-fearing men whom the sharpers have, by oily words, persuaded to undertake the work; for they know full well that there is no advertisement in the world like having Reverend attached to the name of their agent, or among the testimonials appended to their circulars. I would that I were able to convince *some* ministers of the sacredness of their calling, and of the importance of the most zealous care in guarding it from contamination.

So far as the winged, feathered, and four-footed tribes are concerned, we have, my friends, but little to fear from enemies of bees, and we shall have but an easy task to keep them in subservience; but from ignorant and unprincipled men we have much to fear; and we have abundant need of the most earnest and faithful work, in the shape of Christian kindness, united with a firm and decided stand against speculators and sharpers.

ENTRANCES TO HIVES. I do not know that it makes any *very* great difference to the bees, or with the amount of honey gathered, where the entrance is; whether at the very lowest part of the hive, or right in the top. I have had them do well with their entrance in almost all positions. On many accounts, an entrance even with, or a little below, the bottom board of the hive would be most desirable. This gives the bees every facility for removing filth, or dead bees that frequently clog the hive and combs in cold weather, also bits of refuse comb, cappings from the cells, dust &c., for this all falls to the bottom of the hive, and is naturally carried toward the entrance by the passage out and in, of the inmates. Also, if the upper part of the hive is close and warm, the warm air generated by the cluster, rising by its lightness, compared with the colder air out doors, has a much less chance for escape, than if the entrance were nearer the top of the hive. If the entrance is a little below the bottom board, cold winds and storms, are not so readily admitted.

It has been said that an entrance part way up will not be so liable to become clogged with dead bees. This I admit, but I think it would be much better to have no dead bees at all in the hive, and we seldom, if

* For further particulars, and also for descriptions of *Asilus Missouriensis*, *Mallophora oreina*, *Mallophora bomboidea*, and other insect enemies to bees, see Prof. Cook's *Manual*.

ever, see any in the chaff hive or in any hive that is equally well protected. It has also been said, that if the bees could get in nearer the top of the hive, they would have a short path to the center of the brood nest, where they generally make their way about as soon as they gain a foothold. This I admit in part, but if we give the bees this short cut *in*, we also give the warm air of the brood nest, a short cut *out*. Besides, with the shallow L. frames we use and advise, the bees have but a short distance to climb. All things considered, I think we cannot do better than to have the entrance just below the bottom board, as in the two hives we have illustrated. In the Simplicity hive, the entrance is made by pushing the hive forward so as to project a little over the bottom board. This arrangement, while about as simple as anything can be, has some very decided advantages; if the entrance is to be enlarged, it is done by simply moving the hive forward still farther. This gives the most thorough ventilation, without in any way confusing the bees by making unusual openings; and with a very strong colony, it permits all hands to rush out for the fields in the morning, with a facility I have never seen in any other arrangement. With the old style L. hives, we used to have a ventilator at the back. Of course these ventilators would be used by the bees as places of exit. If we covered them with wire cloth, bees would be constantly biting and buzzing at the wires, trying to get out. Why not let them use these for entrances? Well, so we did, but when it became desirable to close them in the fall, many bees would be confused and lost, when by simply enlarging and contracting the usual entrance, we have no such trouble.

I need hardly add that where we have the entrances arranged in this manner, close to the ground, we *must* have the ground clean and free from weeds for several feet around and in front of the hive. See APIARY and ALIGHTING BOARDS.

The entrances to all hives, in the winter time, should be closed to such a width that no mice can by any possibility get in; if they do not exceed $\frac{3}{8}$ of an inch, there will be no danger. When bees are wintered in the open air without protection, the dead bees are liable to fall down, and clog the entrance. As soon as a warm day comes, they will try desperately to get out. The apiarist should be on hand at such a time, and while he lifts the hive from the bottom board, an assistant with a broom, should quickly brush off

every accumulation. The hives and combs should then be fixed so that no more may straggle away from the cluster and get frozen between the empty combs.

SIZE OF ENTRANCES.

With strong colonies, this is a matter of no great importance, providing the entrance is large enough to let all the bees out and in readily, in the height of the honey season, and not so large as to let in too great an amount of cold air during the severest winter weather. In the house apiary, we use a two inch auger hole, but it is in reality, reduced to about $1\frac{1}{2}$, by a piece of thin white-wood veneer steamed and rolled up into a tube. The size of these entrances seems about right for a strong colony; if the colony is weak, we reduce it with a wad of paper. The entrances are left full size all winter, and all things considered, I think the size is about right. We were, one winter, troubled somewhat by mice getting in at the lower ones, and metal guards were made, reducing the size to a $\frac{3}{8}$ inch slot; this kept out the mice, but it bothered the bees so much that we were glad to take them away, and get a big cat, to guard the outside, which he has done so faithfully, that we have had no farther trouble. See ENEMIES OF BEES.

The entrances to the chaff hives are $\frac{3}{8}$ wide, by about 8 inches long. If the colony is a full one, we leave them open full length all winter. If weak, contract to about one inch; and for nuclei, sometimes, so that just a single bee can pass. We contract them by cutting a piece of wood $7 \times 2 \times \frac{1}{2}$, and covering it with some warm thick woolen cloth. Some apiarists, I believe, practice closing the entrances to all hives during very severe weather, opening them again when the weather moderates. This, I think, is carrying the matter entirely too far, and it reminds one of the philanthropic old gentleman who stood in the rain while he held his umbrella over the ducks in a puddle. We have wintered bees in the chaff hives, with the entrance open its whole length, during the most severe winters, with scarcely a dead bee having been brought out when it came off warm, and I think the bees are perfectly capable of taking care of themselves, for at least six months of the year, if they have proper food and protection. To have the entrance left open full width, of course we must have the hive contracted to a small compass and perfectly closed above, or the entrance will draw in the cold air, like the draft to a stove. Stop every crack and crevice, with chaff

cushions tightly crowded in, and if you do your work well, instead of cold air forcing its way *in* at the entrance, you will find the bees can keep warm, and send a stream of hot air *out* at the entrance besides, as soon as they commence rearing brood in the spring. If you have hives that you cannot close up with the chaff cushions, as I have advised, it may be best to close the entrances during very severe weather; but I think I would always leave room enough for one or two bees to pass, lest they be forgotten, when warm weather comes unexpectedly. It is very bad policy to confine bees to their hives when the weather is such that they would try to get out. Bees wintered in a dark cool cellar may have wire cloth tacked over the front and top to keep them from getting on the floor, if you choose, but in this case you should take them out and release them should the weather get so warm that they are impatient or uneasy. When bees are wintered on their summer stands, they are always ready for a fly whenever a warm day occurs, and are in shape to take care of themselves, under almost any circumstances, providing they have a free and unobstructed entrance.

Mr. Quinby and others have recommended having an auger hole in the front end of the hive, and adduce as proof of its utility, that the bees at once show a preference for this pass way. I have no doubt of it, and I think if an auger hole were made directly in the top of the hive, they would show a still greater preference for that; but for all this, I do not think it would be best for them. With tall frames, I think such an auger hole might be a great advantage, but with our shallow L. frame I would prefer not to have it, although it would perhaps do no perceptible harm to a strong colony with old and tough combs. You can easily make the experiment, and if you do not like the auger holes, plug them up again. I much prefer you should verify these statements by tests of your own. If I have made a mistake, anywhere, write, and I will correct it, before I send out any more A B C books.

EXTRACTED HONEY. Liquid honey, taken from the comb with the honey extractor, has now been before the world for 10 years, and much has been the discussion pro and con, in regard to its merits, and its desirableness compared with comb honey, for table use. If I have made no mistake, I extracted the first tun of honey ever taken from one apiary, with the extractor; and as it was put directly into market,

and such honey has been kept in market constantly ever since, I have had a pretty good opportunity of knowing all about it.

If all the extracted honey put upon the market were as good as some we have raised and purchased, there would, I am quite sure, be no trouble at all in deciding that it would drive honey in the comb almost out of the question. Much has been said about adulteration, but I have very little fear in that direction. It is almost as impossible to imitate a really fine article of clover or linden honey, as it is to imitate fresh strawberries. Let the people taste of the honey they are asked to buy, and they will very soon say whether they want it, and what they can afford to pay for it.²³

A really nice article of extracted honey will bring 20 or 25c., quicker than a poor article will bring 10 or 15; and I have seen some, aye, and have offered it for sale too, that I do not honestly think was worth over 5c., if it was worth anything at all, unless to feed bees. Is all this difference on account of the source from which it was gathered? Not at all, for all the honey we get here, in the great majority of seasons, is from clover and linden. Then where is the great difference? It is, so far as my experience goes, simply because it is taken from the hive before it is ripe. I know there are many who do not agree with me, and I presume in some seasons, and in some localities, the honey may be ready to extract as fast as it is gathered from the flowers.²⁴ I make this admission solely from what others have said, for I have never seen any honey I thought was fit to extract, until it was all sealed over. Still farther, I do not believe it is nearly as nice, even when it is all sealed over, as it will be if left in the hive three or four weeks *after* it has been all sealed. I will tell you some of my experience to illustrate the point.

In 1870, we extracted from our apiary of less than 50 colonies, over 3 tons of honey. It was put up in 1 lb. bottles, and more than half was sold for 25c. per lb. During the fore part of the season, the honey was allowed to get pretty well capped over, but during basswood bloom, we, bees and all, got somewhat crazy, I fear, and they brought in what was but little better than sweetened water; we extracted and put it into bottles, and hurried it off to fill orders, hoping it would all get "good," as soon as the weather got cool. It candied when the weather became cool, for almost all honey will candy, or at least one portion will can-

dy, leaving a thin watery part, which, if it does not sour, acquires in time a disagreeable brackish flavor, like that acquired by liquids standing in an old barrel. At about this stage, it shows that peculiar quality of pushing the bungs out of the barrels, and the corks out of the bottles, running over on the shelves and tables, to the discomfort and disgust of everybody who likes to be cleanly in his habits. When I tasted some of the honey in one of these bottles, 6 months afterward, I did not wonder it had stopped selling, and I made up my mind it should no more be offered for sale. I believe it was all poured out of the bottles, and sold to a tobacconist. The contents of the jars were not all alike, for the thin watery honey has quite a tendency to swim on top. We, one season, commenced to retail from a barrel of what all pronounced fine clover honey; one day a customer returned some, saying it was not like what he bought before. We assured him it was drawn from the same barrel, and went and drew some, to convince him. Behold! it was sweetened water, compared with the first. The thin honey having risen to the top, was the last to be drawn out.

Again; new honey has, many times, a rank, disagreeable odor and taste. I have been told that in the Eastern States much honey is sometimes obtained from the fields where onion seeds are raised for the market, and that this honey, when first gathered, is so strong of onions that it cannot be used. In a few weeks, however, this rank and disagreeable flavor is all gone, and the honey is very fair. Few persons can tolerate the strong, aromatic flavor of basswood honey when first gathered, and some of the jars I have mentioned, when opened, gave one an impression that something akin to turpentine had been mixed with the honey. This was because it had been closely corked when first gathered; had it been left in the comb until sealed, the unpleasant taste would have been mostly gone. I say mostly, for even sealing does not seem to entirely remove the rank flavor, unless the combs have been some weeks in the hive. A few days ago I took a beautiful looking piece of comb honey out of a jar that was found in the market. On opening the cells I found the honey had such a rank bass-wood flavor, that it was, to me, quite disagreeable, and yet I am fond of the bass-wood flavor. Very white, new comb honey is seldom of the fine, pure, sweet flavor of honey that has been a long time capped

over, such as is found in the dark looking comb. To which shall we give the preference, looks or taste? In 1876 we were so busy that we could not attend to extracting, and so we raised the filled stories up, and put those filled with empty combs just under them over the brood. This occupied little time, and the bees were not hindered in their work, a single moment. I have never seen bees amass stores faster. Some swarms filled 4 stories to repletion, and the whole was left on the hives until the latter part of the summer. In fact, I left them on the hives to be safe from the depredations of the moth, intending to cut out the honey and sell it in the comb, or to extract it, whichever form should prove most marketable. This honey was cut out of the frames and sold the following winter, and it was the nicest and richest honey I ever saw or tasted. To my astonishment, the liquid portions that ran out when the combs were cut, would not candy at all, even when exposed to a zero freeze. The honey was so thick, that a saucer full could be turned over without spilling, and it had a bright crystalline clearness, when compared with ordinary extracted honey.

Extracted honey, if taken out while "green" (as I have often termed the unripened state), has a greenish tinge, which well ripened honey has not. Some specimens have a turbid, or cloudy look, and I believe such honey is never really fine flavored. I am well aware that I am condemning the honey I have been selling, by these remarks, but I cannot help it. If I had now some extracted honey such as was taken from those well ripened combs, I would feel that it was preferable at 25c., to that which I am now selling at 15. Properly ripened bass-wood or clover honey has a sparkling clearness, like white flint glass, and the flavor is pure and exquisite. I have never seen any nice looking comb honey equal to it, for the market always demands comb honey that is white, and has not remained on the hive a long time.²⁵ I do not mean to say that extracted honey should be without color, like water, for it usually has an amber tint, or it may be quite yellow; but it should be clear, so that you can read print without trouble, through a jar of it. After it has candied, if it does candy, it should be hard and free from any liquid portion, like that in unripened honey. This thin liquid portion is the part that usually changes and gives it the bad taste. In fact, if the liquid portion be

drained off, as directed under CANDIED HONEY, the solid portion may be melted, and it will be found very nearly like that ripened in the hive.

HOW TO SELL EXTRACTED HONEY.

Get it well ripened, as I have just told you, and then strain it into clean tin cans, into barrels coated with paraffine or bees-wax, or into some utensil that you know will not taint it in the least. Honey is very easily damaged by anything that will mar its pure flavor, or clear transparent appearance to the eye. If you are going to retail it, you can keep it in a tall can, with a honey gate at the bottom. Set it up at a convenient height, and have a pair of cheap scales directly under the gate, on which you can set the bowls, pitchers, or pails, that your customers may bring. You can by this means weigh it out to a fraction, without any dripping or daubing. If it is to be sold in honey jars, set your jars in a basin, under the gate. I say in a basin, for unless you are more careful than people generally, you will get some over the sides, or run a jar over, and it is much pleasanter to have it in the basin than on the table or floor. I have given the preference to the self sealing quart fruit jars, because every body has use for these, and will be likely to keep them. If the jars are purchased by the gross, they can be retailed with the honey, at a slight advance on first cost, full enough usually, to pay all expenses of handling, and a good interest on the use of the money invested. The Mason jar, which we generally use, costs \$9.00 per gross, and we charge for them with the honey, 10c. A quart jar holds about 3 lbs. One lb. jars sell rather better, but we have to sell three times as many, and consumers have little or no use for the jars when empty. I think it will be well to keep both kinds on hand, as well as some half lb. tumblers or jelly cups, for the multitudes who want "just a little" for one reason or another. If you commence giving now and then, a little without any charge, you will find the demand a severe task on your time as well as honey, and if you have these small packages all ready at hand, for 10 or 15c., you will find a great many will be sold in the course of a year.

If you wish your honey to keep from candying, seal it up hot like fruit, as directed in CANDIED HONEY. The self-sealing fruit jars need no directions, but the bottles with corks will have to be made tight with melted bees-wax. Dip the corks in melted wax

until they are perfectly coated on both sides, and then push them in place while the mouth of the jar is hot, and perfectly dry. If it is wet, or has the least particle of honey on it, you can never make it airtight. To make a neat job of it, you can dip the mouth of the jar carefully, in some bright nice yellow wax, and then you will have it, as far as possible, protected from the air with a capping of wax, precisely as the bees do it.

This thin, watery honey, when heated to melt the candied honey, with which it may be commingled, even if it is exposed to a heat much less than the boiling point, will turn a dark reddish color, and the flavor is something as if the honey was burned slightly. I, at first, was inclined to blame my wife for overheating it, when I desired her to make the experiment, but as the honey was white when this liquid portion was entirely drained off, I finally guessed at the truth. We can get some beautiful, pure, ripe honey, out of a very bad lot, by draining the candied portion for several weeks, and then melting it.

To give you an idea of how extracted honey sells in our cities, I give you a few notes from a friend on the Cleveland market, to whom we have sold several barrels of honey during the past six months. The honey was put up in Muth's 1 lb glass jars. Each jar was labeled, wrapped in a sheet of clean paper, and packed in sawdust, in the same boxes that the jars came in. To prevent the boxes from being "dumped," we nailed strips of wood to each side of the box, rounded off the projecting ends to make convenient handles, and shipped them as freight. The R. R. employes, I suppose, looked at the smooth handles, knowing at once, what they were for, read the label that kindly asked them not to "dump," and the consequence is, not a single bottle has ever been reported injured. Were you a "R. R. man," you would probably do as R. R. men do. Here are the letters.

That honey sold quickly this morning. It you can furnish me that quality, I can sell it. Send the other as soon as possible.

L. B. OVIATT.

Cleveland, O. Aug. 16th, 1877.

We received the one lb. bottles last Friday; put them on the stand Saturday, and retailed 44 of them that day. If you can furnish me that kind of honey I can sell it. The small bottles I have just got from the depot, all in good shape. Please send 12 doz. lb. bottles as soon as possible. Get them here Friday if you can.

L. B. OVIATT.

Cleveland, O. Sept. 3rd, '77.

I shall want some honey in a few days. Have about 30 of the lb. bottles left yet. The lb. bottles

sell best. I am getting very nice comb honey now for 19c per lb. which is hurting the sale of bottled honey. I do not think that will last long. Your honey gives good satisfaction. I scald a few bottles at a time and it makes it look very nice. I will order in a few days.

L. B. OVIATT.

Cleveland, O. Nov. 8th, '77.

Please send me a case of honey if you can send it like the last shipment. That is thicker and better flavored than the other and sells rapidly. Send it in the 1lb. square bottles. I want it the first of the week. I did not know I was so nearly out or I would have ordered before. I am about done with comb honey and I can sell bottles fast after this, if it is nice. What is your price for those tin cans for filling bottles?

L. B. OVIATT.

Cleveland, O. Feb. 22, 1877.

Mr. O. paid us 16c for the 1 lb. bottles, put up in the way I have mentioned. The one lot that he did not like, was some unripened honey that we purchased of a neighbor.

Some attempts have been made to get honey into a marketable shape in its candied state, but so far, have been unsuccessful, so far as I know, although candied honey can be drained out so dry that it may be done up in a paper safely, and we have had some specimens nearly as white as loaf sugar.²⁶

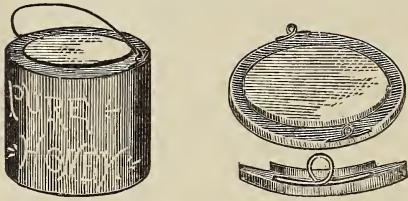
HOW TO KEEP EXTRACTED HONEY.

Where one has a large crop of it, and but a small price is offered, it is sometimes quite an item to know what to do with it. Without question, the very best way to keep it is to seal it up while hot, as before described, either in self sealing jars, or in glass bottles with their corks coated and made tight with bees-wax. The expense of the jars, and the troublesome job of sealing them, is the principal objection. Perhaps, the next best way to keep it is in the coated barrels, or in tin cans.²⁷ A friend keeps his very nicely in stone crocks, with stone covers over them. In these it is candied and is as hard as tallow; but it can easily be cut out, when wanted. After it is candied in the barrels, the hoops must be moved to get it out. See BARRELS. Both extracted and comb honey should be kept in a *dry* room. If this room can be at the same time frost proof, it will be much the better; for when dew or dampness of any kind forms on the surface of honey, it is absorbed, and thus dilutes and injures the honey. This process will, in time, cause it to sour or ferment on the surface, and will surely injure your reputation if you try to sell it. Jars that are used to hold extracted honey are sometimes so hastily washed and rinsed, that enough water is left sticking to the glass, to produce the same effect, and I am quite sure that not a little of the trouble expe-

rienced with bottled honey has come from this cause. Let the bottles be clean and dry, and the honey perfectly sealed while hot. Then you can keep it down cellar, or up stairs, or any where you wish. A friend in the West says he keeps his extracted honey out doors in an open shed all winter, and that when the neighbors come for it, he cuts it out of the barrels with a spade. I think such a place would be preferable to a damp cellar.

It is now November, 1882, and extracted honey has just taken quite an impetus in public favor. A little to my surprise, people are beginning to demand honey that is candied, instead of making it an objection. Our friend C. F. Muth, of Cincinnati, one of the largest honey-dealers in the world, says he now has many customers who will not have honey unless it is candied. Friend Jones, of Canada, of whom mention has been made, has also done much, as has C. H. Dadant, of Hamilton, Ill., toward getting the honey into convenient packages to bring it before the public. Friend Dadant has given us five sizes of covered pails; viz., 1½, 2½, 5, 10, and 25 lbs. respectively. Friend Jones struck on the idea of putting it up in packages still smaller, and commences with a package of only ½ lb. that can be sold for 5 cents, or given away as a sample of the honey. The sizes are ½, ¾, 1 lb., 2½, and 5 lbs. For each size, friend Jones has originated beautiful lithographed labels, which are, in fact, beautiful chromos; and as the surface is varnished, these labels are easily cleaned, if any honey gets daubed on their surface. The ½ and ¾ sizes are simply tin boxes with a cover slipping over, and are to be taken to the grocer, with the honey in a tin can, and he fills them as they are sold. They are easily handled when filled, after the honey has become candied. The ¾ and 1 lb. boxes are made so they can be sealed up by wax, or the ordinary fruit-can cement, and thus become marketable, already filled. The 2½ and 5 lb. are made in a similar way, but have bails so as to make a very pretty little pail when labeled with these chromo labels. As the covers are easily removed without injuring the pail, the purchaser has a very handy little pail for use, after the honey is taken out. All of these sizes that close with cement can be sealed up while the honey is hot, and thus prevent granulation. Some very handy waxed strings have been devised, for sealing these pails and boxes rapidly, and in a cleanly manner.

Below we give you a picture of a 2½-lb. pail, showing the manner in which it is made.

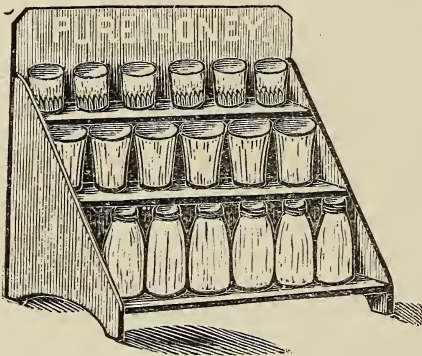


JONES'S 2½-POUND HONEY-PAIL.

The 5-lb. pail is exactly like it, only twice as high. These pails are made so cheaply that their expense is less than 2 cents per lb. for each pound of honey they contain.

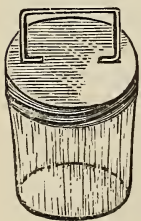
HONEY-TUMBLERS.

A large trade has also sprung up in honey put up in jelly-tumblers. These are of two sizes, chiefly; those holding ½ lb. and 1 lb. They are made honey-tight by laying a piece of soft paper over the tumbler before the tin cover is pressed on, and then tearing off the surplus paper. Covering the paper on the side next the honey, with the white of an egg, makes a hermetically close joint. The tumblers cost only three and five cents each respectively. Below we present you with a handy stand for exposing for sale honey put up, invented by Geo. F. Williams, of New Philadelphia, Ohio.



WILLIAMS' STAND FOR SELLING EXTRACTED HONEY.

The large jars are the pint Mason fruit-jars, which hold 1½ lbs. of honey. During pleasant weather this stand may be placed on the sidewalk in front of the store, and the grocer can be paid a commission for simply keeping the stand full. After he has got a trade started, he will usually be willing to buy the honey for cash, at a reasonable price. We herewith show a modification of the



HONEY-PAIL, OF GLASS.

jelly-tumbler, called a glass pail. Of course, the top to this must screw on securely, or there will be danger of the bail, cover, and all, coming off at the wrong time.

EXTRACTOR. The advantages and disadvantages of using a honey extractor in the apiary are considered under head of extracted honey. That more honey can be obtained by the use of the machine than by having it stored in section boxes in the shape of comb honey, all are agreed; but all are not agreed as to *how much* more. If it is nicely sealed over as it should be before being extracted, I do not think more than twice as much will be obtained, on an average, although the amount is placed by many, at a much higher figure. A beginner will be more certain of a crop, than if he relies upon having the bees work in boxes; he will also be much more apt to take away too much, and to cause his bees to starve. This last is a very disagreeable feature attendant upon the use of the implement, especially, where the bee-keeper is prone to carelessness and negligence. To secure the best results with the extractor, plenty of empty combs should be provided, that ample room may be given, in case the hives should become full before the honey is ripe enough to remove. If a second story does not give room sufficient, I would add a third for a heavy stock, during a good yield of honey.

Full directions for using extractors are given with the price lists that manufacturers send out; therefore I will not repeat them here.

HOW TO MAKE AN EXTRACTOR.

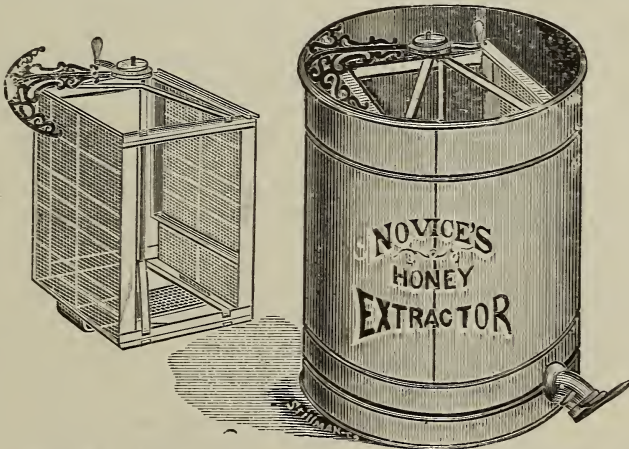
Although it will not usually pay to make your own, there are circumstances under which it is very desirable to know how. In places so remote that the shipping rates are very high, it would be well to have some bee-keeper of a mechanical turn make them to supply those in his own vicinity. As the manufacture of implements and supplies is getting to be quite a business, the machines can probably be manufactured at many different points. Whoever does the best work will probably get the most orders.

Experiments have been made, almost without number, and the general decision now seems to be in favor of a machine made entirely of metal, with everything stationary about it except what *must* be revolved. The momentum of heavy, metal, revolving cans, or of honey after it has left the comb, defeats the very object we have in view; and nothing will so effectually convince one of the difference, as an actual trial of the two ma-

chines side by side. With the light, all metal machines, the comb is revolved at the speed required almost instantly, and as soon as the honey is out of the comb, the operator is aware of it, by the decrease in the weight as he holds the crank in his hand; but with the heavy, unwieldy machines, the stopping and starting take more time than doing the work. The same objections apply to making machines for emptying four combs at once. They require to be made much larger, and are correspondingly heavy and unwieldy.

A reference to the engraving of the extractor with its inside removed, will enable almost any tin-smith to do the work. The gearing had better be purchased from a dealer in supplies, but if you should have many to make, it may pay you to have them cast, using the sample for a pattern. The shaft of the inside part is made by rolling up a tin tube, double thickness. This is quickly and

these bars, and still another lies flatwise across this, to brace the whole something like a truss bridge. This gives a surface very stiff, and yet very light. The wire cloth, which should be tinned like all the other metal work, is made of stiff wire, 5 meshes to the inch. It may be well to remark here that neither zinc nor galvanized iron should ever be used about honey utensils. The acid principle in the honey quickly acts on all oxidizable metals, and galvanized iron, though bright in appearance, quickly poisons the honey, or even pure water, as has been proven by experiment. Two sheets of wire cloth, 15 inches long by 10 wide, are needed for an L. extractor. They are simply laid inside against the metal bars and tacked with solder. To cover the ragged edges at the top and bottom, we fold a strip of light tin 10 inches long by $\frac{1}{2}$ inch wide, at a right angle, so as to make a square trough, as it were; this is soldered on the top rod, so as



INSIDE OF EXTRACTOR.

EXTRACTOR COMPLETE.

nicely done with the machine the tinner uses to make the bead on the edge of eave-spouts. The frame work is made of folded strips of tin.

For a Langstroth frame, we make the shaft the full length of a 14 by 20 sheet of tin. The corner pieces are made of a strip 2 inches wide, by 14 long, with a seam folded on one edge, and a square fold of $\frac{1}{4}$ on the other. The bars that support the wire cloth are six in number, including the top and bottom ones, and are made by folding one inch strips of tin, three times, so as to make a stiff rod of metal. They are 10 inches in length, and our revolving frame is 10 inches one way, and 11 the other. For greater security against sagging, we run a similar rod of metal, up and down across the middle of

to cover the upper edge of the wire cloth. A strip of wire cloth, 15 inches long, and 4 wide, with the edges hemmed by folded strips of tin, is put across the bottom, to support the frames. Two inches from each end, it is bent at right angles, and then $\frac{1}{4}$ inch from each end, still again, that it may catch securely over the lower bar of the frame. The frame is completed by the cross pieces at the top and bottom, to hold the two wire cloth frames at the right distance apart. These are strips of heavy tin $1\frac{1}{2}$ inches wide, by 11 inches long. A seam is folded on each edge, so that the bars are left only 1 inch wide when finished. At each end, a $\frac{1}{4}$ inch is folded square, to catch over the outside of the frame where it is soldered.

Now, to attach this frame to the shaft is a

matter somewhat important; for, if we use too much breadth of surface with our arms, they will "blow" like a fanning-mill, and we shall have a current of air, that will carry with it a fine spray of honey, over the top of the can. This is a most grievous fault, for who likes to have honey daubed over his clothing? Our first machine was made so that the combs revolved only $\frac{1}{2}$ inch below the top of the can, and yet we never had a particle of honey thrown over. This frame was made very light, indeed, and when heavier and stronger machines were made for sale, we were much puzzled to hear an occasional complaint, that the honey was thrown over the top of the can, in a fine spray. I soon found by experiment, that it was caused by the braces being placed flatwise to the line of motion. How to make them strong and stiff, without catching the air, was the problem. We do it nicely, by using 12 braces, made of heavy tin, with a seam folded as just mentioned. The 12 are formed of six pieces. The 6 pieces are laid across each other in pairs, forming 3 letter X's. Each letter X has a hole punched at the crossing, large enough for the shaft to be driven through; when it is soldered securely, the ends are bent down and attached to the corners of the frame as shown in the engraving. The lower X also supports the wire cloth that the frames rest on, by being tacked with solder where it passes it.

The gearing is attached to this revolving frame, by driving the small gear wheel into the end of the hollow shaft, and soldering it securely. The casting is first well tinned by a soldering iron, that there may be no slipping loose.

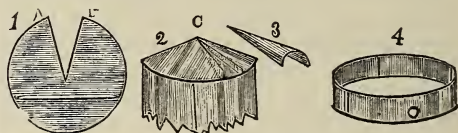
MAKING THE CAN.

There is nothing difficult about this, except the bottom of the can. It had been, for a long time, quite a problem to get a strong stiff bottom, without some kind of a wooden support; but I struck on the idea, while trying to devise some kind of a bottom that would let the honey all out, the gate or faucet being the lowest part. I will tell you, presently, how I did it. The top edge of the can must be stiff and rigid; more so than we can get it, by any kind of a wire or rod. I found some very stiff hoops that were made for milk-cans, and it is these I would advise. They are so made as to give great stiffness, with but a small amount of metal.

We present a view of a cross-section of the hoop, the concave side, of course being inward. A is the hoop, and B is the tin of

which the can is formed. The can is made of four sheets of 14x20, IX itn. For an L. frame, we need a hoop just 17 inches in diameter. For large sizes, we use 20 inch hoops. The two sizes mentioned will accommodate almost any frame used, and we therefore furnish gearing for only these two sizes. After you have made the body of the can, and have your hoop nicely soldered on, you are ready for the bottom.

Lock two of the sheets together, and cut a circular piece 18 inches in diameter. From one side, cut a wedge shaped piece, as shown in the cut below.



HOW TO MAKE THE BOTTOM TO THE CAN OF THE EXTRACTOR.

The space, A B, should be about 2 inches in width; and, after cutting it out, you are to fold down the edges of A B, about $\frac{1}{2}$ inch. Draw these edges toward each other, and you will make the bottom concave, as shown in Fig. 2. They can be held in this shape for the time, by a slip of tin, temporarily tacked with solder across the gap. Turn over the edge and put this bottom on the can, in the usual way. The opening left is for the channel that leads to and holds the honey gate. Cut a piece of tin similar to the wedge shaped piece you took out, but somewhat larger. Fold this up trough shaped, as shown in Fig. 3, and fit it over the opening. We are now ready to solder in the gate, but we must have something for our can to stand on. This is fixed by a tin hoop, with a heavy wire at its lower edge, made just large enough to slip closely over the lower part of the can, as seen in Fig. 4. This hoop, or band rather, should be about 4 inches wide, and in one side you are to punch a round hole, just large enough to take in the gate. Solder it securely in place, put in the gate, and then be sure to try your can by pouring in some water to see if it will "hold." We do not want any leaking after we commence extracting honey.

Now, in the center, C, on the inside, we solder a piece of steel saw plate; over this, we put a blank iron nut, with a $\frac{1}{4}$ inch hole drilled in it. This is to hold the bottom pivot, which is made of refined Stub's steel, nicely rounded and polished off on the point. As the bearings for the gearing are all cast steel, our machine should almost run of itself,

if everything is made just right. The steel pivot at the bottom is soldered in the end of our tin tube, by rolling some thin tin around it until it will drive in tight.

You should never attempt to use an extractor, and I might almost say *any* piece of machinery, until you have it securely screwed down to the box or platform on which it is to stand. The screw holes are made in the bottom ring just above the heavy wire that rests on the floor. The screws are put in a little slanting. It should also be at a convenient height for easy work. The machine could be made heavy enough to stand still from its own weight, it is true, and it might be made perched on legs, also, to save the trouble of building a box or platform on which to stand it, and if you are making them for home use, it may be well to do so; but if making them to ship to customers, I would never think of sending them anything that they could procure at home, thus saving heavy shipping expenses. I would say the same in regard to making cans large enough to hold 100 lbs., or more, of honey, below the revolving frame. When the extractor is being used, the honey gate is supposed to be open, and utensils can always be supplied to hold the honey, much cheaper than to have the extractor thus enlarged. Those I have described, can be very conveniently worked over the bung of a barrel, or you can have a tin can made on purpose to set under the honey gate.

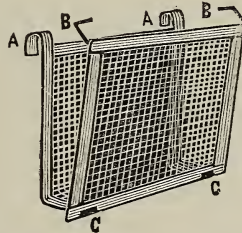
The gearing for the extractor, including a tinned honey gate, will cost about \$2.00; the materials and labor for the inside should not cost to exceed \$2.50; seven sheets of tin for the can, would be 70c; a half day's work in the making, \$1.25; hoop for the top, 50c; and perhaps the solder and other items, 25c; this would bring the whole cost up to \$7.20. Your own time in "bossing" the tinner, and the liabilities of making mistakes, and doing a bad job on the first one, would probably bring the expense up to about the usual selling price, viz., from \$7.50 to \$9.00. Machines for different sized frames are made much in the same way; for the American and Gallup frames, we can make a short can, only the height of the width of a sheet of tin, instead of the length. Of course, these can be made at a less cost. Where the frames hang in the extractor the same way that they do in the hive, no wire cloth support is needed across the bottom of the comb basket, unless it is preferred for extracting small pieces or bits of comb.

No cover is ever needed over the extractor while at work, for it would be greatly in the way; but after we are through, or only stop temporarily, the machine should be covered to keep out dust and insects. The most convenient thing for this purpose is a circular piece of cheap cloth, with a rubber cord run in the hem. This can be thrown over in an instant and all is secure. When honey is coming in abundantly, it may be safe to carry the machine, located on a suitable platform, around to the hives, especially if the apiary is much scattered about. But if the bees are disposed to rob, all such attempts will come to "grief" very quickly.

EXTRACTING FROM BROKEN PIECES OF COMB OR FROM SECTION BOXES.

As we always use the L. extractor, we have extracted from pieces of comb, by setting them up on the wire cloth at the bottom. The smaller, shallow extractors, for Gallup, Adair, and American frames, have no such attachment; therefore some arrangement is really needed for the purpose. At the same time, it would be very handy for the tall extractors, when any mishap occurs to break a comb down, or when we wish to extract from heavy pieces of comb, in warm weather. Several devices have been described in the journals, but none of them suit me so well as the one figured below, which was sent me by J. D. Slack, of Plaquemine, La.

He uses it for extracting from section boxes also, but I think I should prefer to do this in the broad frames that hold them, thus doing a full set of eight at one time. With this machine, only one could be extracted at once.



EXTRACTOR FOR PIECES OF COMB.

At C are a pair of hinges, that the machine may be opened the more readily to receive a heavy, soft comb. The wires, B, are of one piece, and are also made to turn that they may be hooked into A, when the comb is properly in place. The hooks, A, are to hook over the top bar of the inside of the revolving frame of the extractor.

F.

FEEDING AND FEEDERS. As a general rule, I would not advise beginners to take away and sell their honey, with the idea of feeding their stocks up in the fall with some substitute for honey; and if a person is inclined to be careless and neglectful they had better never think of feeding at all. Leave the 10 combs in the lower story untouched by the extractor, and you will very seldom have reason to feed.²⁸ If you use section boxes in the lower story, you had better take them all out in time to let the bees fill combs for winter stores, in their place, unless you have very heavy surplus combs laid away, that will contain on an average 5 lbs. of sealed honey each; in this case, give them 6 of these combs and a chaff cushion division board on each side of them in place of the sections, and you have them then in the safest shape for winter, you possibly can, providing they are in a chaff hive (according to *my* ideas of wintering). Now if we were only sure of having the well filled surplus combs, we might skip "feeding" entirely, but alas, there will come seasons and circumstances when we must feed. I have never known a season when a colony of Italians with a good queen would not get an ample supply for winter, and furnish some surplus; but I am told there are such occasionally, and the present one (1877) is said to have left many in a starving condition in California, right in mid-summer.

Again, where one raises bees and queens for sale, they may divide and sub-divide to such an extent as to have many colonies with bees enough, but with too little food. The only remedy in these cases is to feed.

WHAT TO FEED.

If I had sealed honey in the combs, I should use it for giving the requisite stores in preference to sugar, unless I could sell it for more, pound for pound, than the sugar could be purchased for. If the honey is late fall honey, such as buckwheat, golden rod,

autumn wild flowers, etc., I should consider it just as safe as any other if well seasoned and ripened, unless I had by actual experiment good reason to think otherwise; in such a case I would feed sugar. Quite a number of reports have been given that seemed to show bees wintered safely on the spring honey, or that gathered in the early part of the season, when others in the same apiary where all this spring honey was extracted, and they were confined to the autumn stores for winter, were badly diseased. Whether a chaff packing around them would enable them to use such honey with safety or not, remains to be shown; but I have much faith that it would, for all the bad honey I have ever experimented with, could be used with perfect safety in warm weather.

Well, supposing we have *not* the honey in frames, what then? If we have extracted honey two questions come up; which is better? sugar syrup, or honey? and which will cost the most? I would unhesitatingly take syrup made from granulated sugar, in place of the best clover or any other kind of honey, if offered at the same price. I say this after having fed many barrels of sugar, and after having carefully noted the results of feeding both sugar and honey.

In regard to expense: a gallon of water to 20 lbs. of sugar will make 28 lbs. of nice thick syrup, and as the sugar is now worth about 11 cents by the barrel, our syrup will cost us about 8 cents per lb. I think, if my extracted honey were all ready to ship, and I could get 10 cents cash for it, I would sell it and buy the sugar. Perhaps a safe rule will be to say that whenever we can trade a pound of honey for a pound of sugar, we had better do so, for the difference in favor of sugar will certainly pay for all the trouble of making it into syrup.

In regard to the cheaper grades of sugar than the standard A, I will say that I have used the C sugar, without being able to detect any difference in the results; but as the

price is but very little different, I rather decided in my own mind, without any definite proof, that the A contained about the same amount of pure sugar, *for the money*, as did any of the cheaper grades. I also fed a few colonies for winter on the cheapest brown sugar, and somewhat contrary to my expectations, they wintered tolerably well. I have not used brown sugar extensively, because in my experiments with candy for feeding, I discovered that burnt candy or sugar—caramel—was certain poison to bees when confined to such stores in cold weather. See CANDY. As brown sugar frequently owes its color and taste to this same caramel, it is very unsafe for winter food.

HOW TO FEED.

Although the number of feeders described, invented, patented, and offered for sale are almost without number, I would pass them all without notice (and I have pretty thoroughly tried nearly all of them), except the simple atmospheric or "pepper box feeder," that has been so often described. A pepper box explains the whole principle if you fill it with water and invert it, and in fact you may use the cheap tin pepper boxes for feeders if you have but few colonies. Fill one with honey or syrup, place it in front of the hive at nightfall, and you will find it all taken into the hive by morning, without a single bee or any part of the hive having become daubed or sticky; those who have fussed with feeders know how untidy and disagreeable everything soon gets, unless great care is taken.

I would feed outside the hive, because I think the bees behave more naturally when the food comes in this way, and because, by so doing, the labor of opening and closing the hives and disturbing things inside for the accommodation of a feeder is avoided; also, if we feed during the day time, the bees all stay at home, and the honey that might otherwise have been gathered is lost. I have several times fed stocks during the fall to build them up, and although they were induced to take many pounds of honey or syrup, they would be in no better condition than others that had not been fed at all, for they "loafed" and fussed with their feeder, while the rest were doing very fair day's works. Again, I once gave a particular colony all the cappings during extracting time; the honey they got out of them amounted to 3 or 4 lbs. per day, but this was only about half as much as we were before getting from them, and we soon became satisfied that the honey in the cappings was

even worse than thrown away, for it had induced the bees to stay at home, when they would otherwise have gathered a much larger quantity from the fields. This result has followed feeding so many times, that we are loth to resort to it, when it can be avoided. Feeding sugar, especially the cheap sugars, is less liable to disturb their work in the fields, than honey, for they will desert the sugar as soon as honey is to be obtained even in small quantities.

The feeders we use generally, are one quart fruit cans with a cover of perforated tin; these cost only 10 cents each, and they are pretty sure to be emptied in a single night. When placed in front of the hive near the entrance, they should be slightly raised with bits of wood, that the bees may have a fair chance at all the holes in the cap at once. If by any means the feeding has been delayed until very late, or if you have many colonies to feed and but little time in which to do it, you can use a feeder that will hold enough at one time to give them their winter rations. This size has been termed a "tea-kettle feeder" on account of its size and shape. I have with such a feeder given a colony 25 lbs. of syrup in less than a half day. These large ones we place in the upper story, as they may not be emptied in a day or two. If they are set directly on the frames, right over the brood, they will be emptied soonest. When these feeders are first inverted it should be done over a pan of the syrup, for a little will run out before it gets level and quiet. After inversion, they may be carried to any part of the apiary.

HOW TO MAKE THE SYRUP.

After stirring the sugar and water, you can boil it if you choose, but I assure you it does not do a particle of good, and should you burn it a little, it may do a great deal of harm. If you have an extractor, pour in your sugar, and some boiling water on it, then turn briskly, and your syrup will all be ready to draw off into the feeders. I have fed a barrel of sugar in less than 3 hours and had it all done with, except removing the feeders when they were emptied. The barrel was broken open in a large tank, and the staves and heads were washed with a tea-kettle of boiling water. More water was poured in, and the whole was stirred with a hoe, until it was a fair syrup. Large feeders were then filled and placed on a shelf in the tank, until they had ceased to drip. From this they were removed to the hives just at dusk, that no robbers might

interfere. When all were filled, the tank was rinsed out with the tea-kettle, and the rinsings placed over a hive, in the feeder, so that not an ounce of sugar was wasted.

Cream of tartar, tartaric acid, vinegar, and the like, have been used for preventing granulation, but I feel sure we do not need any thing besides pure water and pure sugar, and I think it makes little difference what the proportions are. If the sugar and water be *boiled* together, there is perhaps less liability to granulate. We *now* do it rapidly by means of a steam-pipe let down into the syrup.

FEEDING FAST OR SLOWLY.

I have not been able to see that it makes any material difference whether we feed it all at once, or a little at a time for wintering purposes only, but for brood rearing it is assuredly best to feed a little at a time, say a pint every night. I have during severe drouths reared queens, brood, and had beautiful comb built, by the latter plan.

WHEN TO FEED.

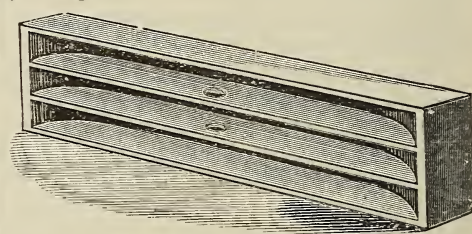
Although colonies have been wintered well when fed after cold or freezing weather, I think much the safer plan is to have it all done during warm dry weather, that they may have it all ripened and thoroughly sealed up. If you have been so careless as to have bees that are in need of stores, at the beginning of winter, I would advise frames of sealed honey if you can get them, and if you cannot, use CANDY; which see. If the candy is covered up with warm chaff cushions or something equivalent, it may be fed at any time, although it does not seem to be as satisfactory under all circumstances as stores sealed up in their combs.

In feeding in cool or cold weather, you are very apt to uncover the cluster, or leave openings that will permit the warmth from the cluster to pass off. I have several times had colonies die in the spring after I commenced feeding, and I imagined it was from this cause alone. When they first commence raising brood in the spring, they need to be packed up closely and snugly; making a hole in the quilt or cushions above the cluster, and placing the feeder over this so as to close it completely, does very well, but is not, after all, as safe as giving the feed from below; for feeding in early spring, especially if the stock is weak, I would prefer the candy, or well filled combs of sealed stores.

Since the above was written, we have had quite an August drouth, and it has given me an opportunity of making a farther test

of the different modes of feeding for the purpose of inducing brood rearing, and of keeping colonies from starving. Plenty of pollen was to be had from the corn fields, though but little, if any honey. Old stocks hung idly a great part of the day, in and on the hives, and nuclei either ceased rearing brood entirely, or reared very little. Many of the queens stopped laying entirely. At this stage, a little feed during the night would start the queens laying wonderfully, and the fed colony would rush to the fields for pollen in a way that demonstrated at once that feeding at such a time was a *very* profitable investment, if one wished to build up weak stocks and nuclei. A stock that had been fed a half teacupful only, would go out for pollen an hour earlier than the others, and would bring in double the quantity. A still smaller quantity will set them to building out foundation most beautifully, and I never in my life saw the work in the hive go on so satisfactorily, as it did during the hot, dry, dusty days, under the influence of a very moderate amount of feeding during the night. I take great pleasure in giving you a feeder, that I think in several respects, rather ahead of the former one.

Get a piece of basswood, pine, or other light soft wood, two inches thick by two wide, and about a foot long; with a buzz-saw set wabbling, plough grooves in it, three in number, as shown in the following engraving.



SIMPLICITY BEE-FEEDER.

We have shown it turned over on one side, that you may see the way in which the grooves are sawed out, so as to leave two thin partitions through the middle. The holes from one partition to the other are to allow all three of the apartments to fill up at once, that the danger of running them over when filling may be avoided. I confess when I made the first one, I was a little fearful, that the bees would drown in them after all; but when I saw how they clung to the wood as they sipped the honey, I had no fear, and after a trial of them for several weeks with all kinds of feed, all the way from sweetened water to syrup as thick

as tar, all kinds of candied honey, sugar and water stirred up hastily in all proportions, &c., I have yet to see a single dead bee in a feeder. They may be used inside the hive, in the upper story, before the entrance, or where you choose.

They are always emptied in a twinkling, and with perfect safety to the bees. Where we are building up stocks, we set them in the hive, close to the division board. For a full colony, we set them just before the entrance; if the hive has blocks and a portico, set them across from one entrance block to the other. In this case they may remain there as long as you are feeding. All you have to do is to go round with your coffee pot of feed just at dusk, and fill them up: you can not drown a bee, even if they are crowded into the feeder when you pour it in. Pour it right on their backs, and all over them; they will like it all the better that way. For feeding the two frame nuclei (see QUEEN REARING) set the feeder on the end of the shelf, in front of the entrance. To get them started, pour a little of the feed into the hive; they will very soon "boil out," and discover the feed. Even a weak nucleus will empty the feeder in a very short time—long before morning. If you have but a little feeding to do, just put some sugar in the trough, wet it with a little water, and it is all done, without even soiling your hands.

With all the desirable qualities of these feeders, they are cheaper than anything that has heretofore come under our notice. The size we have mentioned holds about one pint, and can be made and sold as low as 5 cents, or 4 cents by the hundred.

FEEDING TO PRODUCE COMB HONEY.

You *could* feed white sugar so as to produce very nice looking comb honey, but it would be sugar syrup in honey comb, after all, as you would find to your sorrow if you should attempt to sell it as honey; and furthermore, it is doubtful if you could do it without losing money, were such not the case. Many are the attempts that have been made to produce honey by feeding sugar; but all have resulted in failures. Where you can purchase nice white extracted honey for 10c, you may be able to feed it so as to make it pay, if you can get 20 or 25c for the honey in the comb. Several of our neighbors have fed out their extracted honey in this way, and they think it can be done profitably, with the aid of the foundation. This should all be done by a few colonies, because they must have quite a quan-

tity, perhaps 25 lbs., before they are in shape to build comb. The feed should then be given as rapidly as possible, if we wish to get nice white honey; for the quicker we can get our comb honey out of the hive, the whiter and nicer will it be. Bees when fed, are to some extent demoralized, and forget to be as particular as they usually are, about being neat and tidy. Sometimes they will scamper over the white honey with dirty feet, like a lot of children who have been fed sweetmeats to an injudicious extent, and this we wish to avoid. I am just now making some experiments in this direction, and have found that a common milk pan placed in a third story, on a Simplicity hive, answers the purpose excellently. The first story contains the brood combs, the second, the section boxes supplied with foundation as usual, while the third contains nothing but the pan of syrup. The plan of preventing the bees from drowning is very simple; a sheet of cheese cloth is spread over the pan, before pouring the honey into it. I have had but *very few* bees drowned in this manner, but it is not as clean and simple as the wood feeder, and as the cloth may get displaced, is not as sure of success; the most awkward or inexperienced person can hardly make a mistake or have a mishap, with the former, and it is very desirable indeed to have implements for bee culture which possess such qualities.

For the purpose of more accurately testing the exact amount of loss incurred in feeding extracted honey, in order to get it into comb honey in the sections, I have had a platform scale made with a dial, that the weight of the hive and all the apparatus may be seen at a glance. A Simplicity hive, 3 story, with section boxes in the second story, was placed thereon, and when the combs in the sections were partly filled, the colony was fed, with the milk pan, as mentioned above, about 50 lbs. I then watched, with great interest, the hand on the dial, to see how many pounds they lost in weight, while the combs were being capped over. To my great surprise, I found that the honey weighed just about as much in the combs as it did in the pan: even after the combs were all nicely capped over, there had been a loss of only about one pound in ten, of the honey fed. As the extracted honey was bought of a neighbor for 10 cts. and the filled sections were readily sold for 25 cts., the investment was a paying one, without question.

There is one point that should not be lost

sight of, however; that is, before the honey will be stored in sections, the brood combs will be filled to repletion, and a large amount of brood will be started. Perhaps 25 lbs. will be used in this way, before they will commence to store in the sections, in real earnest. On this account the brood apartment should be contracted, and all combs removed except those actually needed for the brood. A neighbor now extracts sufficient honey to feed in the fall, for the purpose of getting all his unfinished sections filled, that he may not have such a quantity of dead capital in hand over winter, and no unfilled sections to be taken off and cared for until another season. This is quite an item, as we often have, in our apiary, several thousand partly filled sections to keep over, and a great many will be almost full enough to be marketable. But few colonies should be chosen to do this work, and they should be gentle to handle, as a matter of convenience to the one who does the work.²⁹

LIABILITY OF EXTRACTED HONEY TO CANDY IN THE CELLS, WHEN FED BACK TO THE BEES.

If candied honey is to be fed, of course it must be melted; and it is rather an unpleasant fact, that honey which has been once candied is very apt to candy again, even after the bees have sealed it up in the sections. At least, such has been the result with honey fed in the cool fall weather, and such sections have been slow of sale, on account of the sealed candied honey.

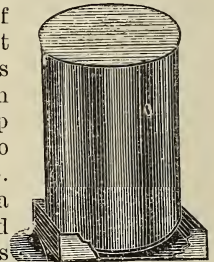
CAUTION IN REGARD TO FEEDING.

Before closing, I would most earnestly caution the inexperienced to beware of getting the bees robbing. I have advised feeding only in the night time, to avoid danger, for attempting to feed in the middle of the day will sometimes result in the robbing and destruction of strong colonies. Where food comes in such quantities, and in such an unnatural way, they seem to forget to post sentinels as usual, and before they have time to recover, bees will pour in from all the hives in the apiary. I do not know who is to be pitied most at such a time, the bees, their helpless owner, or the innocent neighbors and passers by. *Sometimes*, all that can be done is to let your colony slide; and wish for it to get dark that the greedy "elves" may be obliged to go home. Now when you commence feeding, remember that my last words on the matter were, "LOOK OUT."

It is now July, 1878, and after feeding perhaps a ton of the grape sugar, I am prepared to say that it is a decided success for

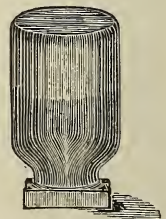
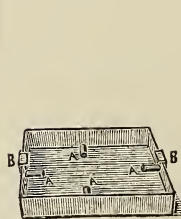
stimulating brood-rearing, for rearing queens, and building up colonies. The only objection I can discover to using it for wintering is its great propensity to candy or harden in the cells (even if it is fed in the form of a very thin syrup), at the approach of cold or even cool weather. It is true, the bees will use it to some extent, even in its solid state; but as I have lost two colonies by starvation, when their combs were quite heavy with the solidified grape sugar, I would not recommend it alone, for wintering purposes. There is just one other objection. The syrup is of a glutinous nature, and when it gets on the bees sometimes glues their wings in such a way that they can not fly, if they are fed in the open feeders, such as have been described for cane sugar or honey. On this account, I would use the Hains' feeder figured below, or one on a similar principle.

These may be made of any size, but the one sent me for a sample was made of a piece of tin about $2\frac{1}{2} \times 4\frac{1}{2}$. Roll it up and solder the edges, so as to make a little cup. The bottom is just a round piece of tin, laid on and soldered. This



cup is to be inverted in a HAINS FEEDER, square tin box as shown in the cut. It is soldered to each of the four sides, so as to be about $\frac{1}{8}$ of an inch from the bottom, or so that no bee can crawl inside. To fill it, dip it in the syrup while on its side, and raise it out, in the position shown in the cut. The bees can take every drop out but they can not possibly get daubed. It can be set in the hive, at the entrance, or any where you wish; pint feeders, can easily be made for 5 cents.

Below we give an engraving of the device to be fastened on a quart fruit-jar.



HAINS FEEDER FOR A FRUIT-JAR.

The jar may be filled level full, before the cover is put on, and it is then to be inverted quickly, in the same manner as the pepper box feeders. The advantage it has over the

latter is that it feeds more rapidly, the places of exit being larger, and the holes never get stopped up and need punching out.

THE DUNHAM FEEDER.

This is simply carrying the idea that friend Hains almost strikes on, a little farther. The lady who invented it, uses it as a pepper box feeder; that is, she simply has the bottom perforated. As this arrangement is much more apt to be leaky, especially, if the hive and machine are not kept exactly level, I would prefer the Hains plan of having a shallow dish at the bottom, instead of perforations. We give below a drawing of both kinds.



DUNHAM FEEDER. MY IMPROVEMENT.

The Dunham feeder, in either of the forms given above, would answer nicely for building up nuclei and for queen rearing. It is made so as to be hung in the hive like a frame, and the syrup is allowed to flow out at the slot along the lower edge, only as fast as the bees take it. No bee can possibly get soiled or daubed by this arrangement, and as the feeder holds enough to last a long time, we can overlook the trifling objection of its having to be taken out of the hive every time it is filled. This feeder is filled by being plunged all over in the syrup, while being held lengthwise up and down; it is then turned to its natural position with the top bar uppermost, lifted out, and hung in the hive. With a large tin box or pail for the purpose, something like a comb basket but larger, feeding can be done very expeditiously, for these feeders can easily be made to hold 20 or 25 lbs. For queen rearing, building out foundation, or building up colonies, the feeder should be so made as to feed not over a pound or two a day. With a weak colony, perhaps not even so much as that should be fed at once.

I have also made some experiments with the liquid syrup or glucose, and find it to work equally as well, but as it costs 5c per lb., and the sugar only 3½, it has not been much used. The glucose is like *very* thick honey, and can not be made to candy. It is quite unlike the syrup of grape sugar, for the latter turns solid without getting like thick syrup at all; as the grape sugar contains a large amount of water of crystallization, much more than the glucose syrup, it may be that the latter is just as cheap, if not the cheapest food for the bees after all.

It will certainly never candy in the cells, and it is so thick it would probably need very little ripening in the cells.

There is very little danger of either of these substances getting in our comb honey, for the bees will not notice them at all, at a time when honey is plentiful in the fields.

For open-air feeding, see page 262.*

FERTILE WORKERS. These queer inmates, or rather occasional inmates, of the hive, are worker bees that lay eggs. Aye, and the eggs they lay hatch, too; but they only hatch drones, and never worker bees. The drones are rather smaller than the drones produced by a queen, but they are nevertheless drones, in every respect, so far as we can discover. It may be well to remark that ordinary worker bees are not neuters, as they are sometimes called; they are considered undeveloped females. Microscopic examination shows the undeveloped germ of nearly every organ found in the queen, and these organs may become, at any time, sufficiently developed, to allow the bee to lay eggs, but never to allow of fertilization by meeting the drone as the queen does.

CAUSE OF FERTILE WORKERS.

It has been over and over again suggested, that bees capable of this egg laying duty are those reared in the vicinity of queen cells, and that by some means they have received a small portion of the royal jelly, necessary to their development as bee mothers. This theory has, I believe, been entirely disproven by many experiments; and it is now pretty generally conceded that fertile workers may make their appearance in any colony or nucleus that has been for some days queenless, and without the means of rearing a queen. Not only may one bee take upon herself these duties, but there may be many of them; and wherever the bee-keeper has been so careless, as to leave his bees destitute of either brood or queen, for 10 days or two weeks, you may be pretty sure he will find evidences of their presence in the shape of eggs scattered about promiscuously; sometimes one, but oftener a half dozen in a single cell. If the matter has been going on for some time, you will see now and then a drone larva, and sometimes two or three crowding each other in their single cell; some

*June, 1882.—We have just had a cold, backward, and wet spring, and at this date, June 10th, we have had no honey from either locust or clover. To keep over 300 colonies from starving, we have fed perhaps a ton of soft maple sugar, by just laying it on top of the frames, without any feeder at all. As the bees fly freely every day, we have fed dark and even burnt sugar, without harm. Unless this feed was kept up, we found brood-rearing would cease invariably: of course, this, at this season, would have been at a great loss.

times they start queen cells over this drone larva; the poor motherless orphans seeming to feel that something is wrong, like a drowning man, are disposed to catch at any straw.

HOW TO GET RID OF FERTILE WORKERS.

I feel very much like saying again, that prevention is better than cure; if a colony, from any cause, becomes queenless, be sure they have unsealed brood of the proper age to raise another; and when this one is raised, be sure that she becomes fertile. It can never do any harm to give a queenless colony eggs and brood, and it may be the saving of it. But suppose you have been so careless as to allow a colony to become queenless, and get weak, what are you to do? If you attempt to give them a queen, and a fertile worker is present, she will be pretty sure to get stung; it is, in fact, often almost impossible to get them to accept even a queen cell. The poor fellows get into a habit of accepting one of the egg laying workers as a queen, and they will have none other, until she is removed; yet you cannot find her, for she is just like any other bee; you may get hold of her, possibly, by carefully noticing the way in which the other bees deport themselves toward her, or you may catch her in the act of egg laying, but even this often fails, for there may be several such in the hive at once. You may give them a small strip of comb containing eggs and brood, but they will seldom start a good queen cell, if they start any at all; for, in the majority of cases, a colony having fertile workers seems perfectly demoralized, so far as getting them into regular work is concerned.

My friends, you have allowed them to get into this condition, by being negligent in supplying brood when they were on the verge of ruin for the want of a single egg or young larva and the remedy now is to give them a fresh invoice of bees, brood, and combs from some other hive; if you wish to make a sure thing, give them at least three good combs of brood and bees. This is almost starting a new colony, but it is the cheapest way, when they get so they will not receive a queen. If the stock has become *very* weak, it may be best to unite them with some other colony for it certainly does not pay to have them killing queens, and tearing down queen cells.

If the fertile workers are discovered when they first make their appearance, before you see any of the drone larvae scattered about, they will often accept a queen cell, or a fertile queen without difficulty. I have before advised giving all colonies or nuclei, some eggs and brood just before the young

queen is old enough to take her flight; when this is done, there can be but little chance of fertile workers, for they will always have the means of rearing another queen, if their own is lost in taking her flight. Sometimes a fertile worker may be disposed of, by moving the combs into an empty hive, placed at a little distance from the other; the bees will nearly all go into their old hive, but the queen, as she thinks herself to be, will remain on the combs. The returning bees will then accept a queen or queen cell. After all is right the combs may be returned, and the fertile worker will be—well, I do not know just what does become of her, but I suspect she either attends to her legitimate business, or gets killed.

See that every hive contains, at all times, during the spring and summer months, at least, brood suitable for rearing a queen, and you will never see a fertile worker.

HOW TO DETECT THE PRESENCE OF FERTILE WORKERS.

If you do not find any queen, and see eggs scattered around promiscuously, some in drone, and some in worker cells, some attached to the side of the cell, instead of the centre of the bottom, where the queen lays them, several in one cell, and none in the next, you may be pretty sure you have a fertile worker. Still later, you will see the worker brood capped with the high convex cappings, indicating clearly, that the brood will never hatch out worker bees. Finding two or more eggs in a cell is never conclusive, for the queen often deposits them in a feeble colony where there are not bees enough to cover the brood. The eggs deposited by a fertile queen are in regular order, as one would plant a field of corn, but those from fertile workers, and usually from drone laying queens, are irregularly scattered about.

FIGWORT (*Scrofularia Nodosa*). This plant is variously known as Square Stalk, Heal All, Carpenter's Square, Rattle Weed, &c., the name indicating some of its peculiarities, or real or supposed valuable medical properties. Much has recently been said in regard to it, under the name of the Simpson Honey Plant, J. A. Simpson, of Alexis, Ills., having first called attention to it.

The engraving presented will give a fair idea of it, and will enable any one to distinguish it at once, if it grows in their locality. The pretty little ball shaped flower, with a lip somewhat like the Pitcher plant, is usually found filled with honey, unless the bees are so numerous as to prevent its accu-



THE SIMPSON HONEY-PLANT.

mulation. This honey is of course thin, like that from clover or other plants, when first gathered, and is in fact rather sweetened water, but still it is crude honey, and the plant promises to furnish a larger quantity than any thing else I have met with. We have had one report from a single plant under cultivation, and as might be expected, the quantity of honey yielded was very much increased, and the plant grew to a great height, continuing to bloom and yield honey for full four months. The little flower when examined closely, is found to be very beautiful. The following is Mr. Simpson's description of the plant:

It is a large coarse grower from 4 to 8 feet in height, coarse leaf, and a branching top covered with innumerable little balls about the size of No. 1 shot. When in bloom there is just one little flower leaf on each ball, which is dark purple, or violet at the outer point and lighter as it approaches the seed ball. The ball has an opening in it at the base of the leaf and is hollow. It is seldom seen in the forenoon without honey shining in it. Take a branch off and turn it down with a sharp shake and the honey will fall in drops. It commences to bloom about the 15th of July and remains until frost. Bees frequent it from morning till night. The honey is a little dark, but of very good quality. I think it would be best to sow in seed bed and transplant.

It grows in its natural state among brush heaps, in fence corners, and amid hedges, to the height of from 3 to 6 feet. The seed is easily gathered in Sept. and Oct. As they vary much in size, it is likely that we could produce a variety with much larger balls, by cultivation, and by a careful selection of the seeds. In doing this, we should be careful to select also such as produce much honey, and if possible, much *good* honey. Bees, and plants too, are like wax in our hands, if we go to work understandingly.

It is now December, 1879, and I have had the plants under cultivation during the past season. The following in regard to them is taken from the Aug. and Sept. GLEANINGS:

SIMPSON'S HONEY-PLANT.

In the spring I purchased about 200 plants of friend Simpson, and planted them on our honey farm, setting them about as far apart as corn. Somewhat to my surprise, they are now, July 8th, commencing to bloom; and, sure enough, every little pitcher-shaped blossom has a shining drop of nectar in it. This nectar is very fair honey, although it has a sort of weedy flavor, which, I presume, the bees will readily remove. The amount of honey is what astonishes me. One of these little flowers contains, I should say, as much as a hundred basswood blossoms. At present, I know of no other plant that promises so well for cultivation for honey alone. A single plant in the garden, for curiosity, if nothing more. I think, would be well worth the trouble to every bee-keeper.

HOW BEES "MAKE" HONEY.

Four o'clock P.M., August 19, 1879.—The Simpson honey-plants are at the back part of the honey farm, and, as it gives me a pretty fair walk, I usually go over there when tired of writing. Well, I have just been over, and the very great numbers of bees on so few plants aroused my curiosity; so, watch in hand (I *borrowed* the watch), I counted the number of bees that visited a certain flower in a certain length of time. To my surprise, they averaged just about a bee a minute. The flower might not be visited for two minutes, and then, again, it would be visited twice in a minute. Well, I very soon discovered that the bees that came twice in a minute made much shorter stays than when an interval of two minutes elapsed. Was it possible that enough honey could collect in that tiny flower to make it profitable for the bees to visit it all day long, from daylight until dark? If so, I ought to be able to see it by looking sharply. I found a flower, in the right position to receive the direct rays

of the sun, and, just after a bee had licked it out clean, I watched the nectaries to see how soon any more honey was visible. To my great astonishment, in just three-fourths of a minute I saw a little shining globule of honey begin to push its way up, right where the bee had licked it off. I watched it most intently — no mistake at all — this little globule was enlarging before my very eyes, and, before two minutes were up, it had spread over, like a little silver mirror, and run along the side of the pitcher-shaped petal of the flower. A bee now became anxious to push his way in, and I let him lick it out, and then saw the process enacted over and over again. To be sure that I was not mistaken, I called a friend, and he, too, saw the little “*tableau*” enacted over and over again.

One thing more : On page 260 I speak of a way the bees seemed to have of reducing thin, watery honey to the proper consistency. Well, I secured a position where the bees would come between myself and the sun, and watched to see how many bees went toward the apiary loaded. To my surprise, I saw one and then another, while on the wing, humming from one flower to another, discharge this same watery fluid, and, when my eye had become accustomed to it, I saw all the bees at work expelling the water in this way, while on the wing. This, then, is the process by which they make clear, crystal honey from the sweetened water, as it were, that is exuding so constantly into the nectaries of these little flowers.³⁰

October, 1880.—This plant has now been grown by the acre, and gives great promise. Plants raised in a hot-bed or cold frame, will blossom the same season, and give quite a crop of honey during Aug., Sept., and often in Oct. I should think one acre would support 10 colonies nicely. The plants are as easily raised and transplanted as cabbage plants, when you get used to them. See SPIDER PLANT and Introduction.

FOUL BROOD. I know of nothing in bee culture so much to be feared as foul brood; and I believe it is pretty generally agreed that all other bee diseases together, and we might almost say all other drawbacks, are as nothing compared to it. It is not a disease of the bees, but of the *sealed brood*. The symptoms are a dwindling down of the colony, because the brood fails to hatch, and when the capping of the sealed brood is examined, it is found to be sunken, instead of slightly convex, as with healthy brood. A little later, the caps are found to have a minute hole in the center, as if a pin

had been pricked through it. It is quite likely that the bees bite these holes through, with a purpose of cleaning out the cells as they do ordinary chilled brood, but becoming disgusted with the sickening sight and smell, they abandon the task in despair. If you take a pin or the point of a knife, and move the matter out of such a cell, you will perceive a strange sickening smell, which is sometimes perceived in simply passing by the hives, when the malady has assumed a very dangerous form. The worst feature of the business seems to be that the disease is communicated to other stocks, by simply carrying honey from an infected hive. This makes sad havoc among bee-keepers who are inclined to be negligent, and various remedies have been given for the malady, many of which are claimed to be perfectly successful; but as the years pass by, one after another of them seems to have been dropped, and the apiarist has been obliged to feel the truth of the old adage, that prevention is better than cure. Many who have had a trial of its ravages, among whom are some of our best bee-keepers, advise destroying both bees and hive, by fire or burying, and commencing anew with healthy colonies. This remedy is, I believe, sure; and even if the disease should reappear, by promptly destroying all diseased brood, the very minute it is discovered in the hives, it seems finally, to become totally eradicated. Where the disease prevails, there should be the utmost diligence exercised in guarding against sending it to other localities, either by selling honey, bees or queens.

Microscopic investigation has revealed the fact, that foul brood is a species of minute fungus, which, when once started growing, increases with astonishing rapidity, and only ceases to extend, when the supply of material that it feeds on gives out, or the temperature is either raised or lowered to such a point that the vegetation is killed. It is on this account that honey from diseased hives is rendered perfectly wholesome for feeding bees, by being scalded, as this is fatal to the seeds of all such microscopic vegetation. As severe freezing produces the same result, we may suppose that hives that have contained foul broody stocks, would be rendered safe, by being exposed to severe winter weather, without bees in them. Great care should be exercised in this respect, however, and perhaps it will be safest, all things considered, to burn up all hives that have ever contained the infection.

The name of the microscopic plant is *Cryptococcus Alveario*; you know we always feel a great deal better, to know just what a thing is. I have never possessed a colony having the disease, but pieces of comb containing the diseased brood have been sent me several times, and I have examined hives in the State of Michigan, that were slightly affected, and feel somewhat acquainted with the disease. I do not know that it now exists in the State of Ohio, unless it is on Kelley's Island, in Lake Erie; it was brought there, by a simple piece of comb, several years ago, and has existed there ever since.

REMEDIES.

I believe the most successful remedy, all things considered, has been in shaking the bees from their combs, putting them into a new hive without combs, and leaving them confined to it until they have consumed every bit of honey in their honey sacks, which will take from 24 to 48 hours. They must, in fact, be almost starved to death. After this, they can be fed and allowed to build comb, and when the queen lays in this new comb, the brood will usually be found healthy and natural.³¹ If it should show diseased cells, go through the same operation again, being sure that other bees do not, by any means, get a single taste of the honey from the infected hive, and you will be pretty sure to find them all right.

Much has been said of late years, of salicylic acid; and our German neighbors across the water, who gave us this discovery with many others, claim to have been perfectly successful, as well as quite a number who have tried it in our own country. The acid is used in solution, and even if quite weak, it seems to have the property of killing the germs of the disease, wherever it touches. To make a sure thing of it, it seems that every diseased cell should have its cap opened, and some of the solution sprayed into it; but quite a number report having succeeded by simply spraying the combs. Mr. Muth, of Cincinnati, O., recommends using borax with the salicylic acid; about $\frac{1}{4}$ of an oz. of each is dissolved in a pint of pure soft water. With this, he has been perfectly successful in ridding his apiary of it by a single application. As some of our English correspondents failed, using the most thorough measures with the acid, I am inclined to think there are several phases of the disease, although I have no doubt at all, but that it will yield, like almost everything else, to thorough and faith-

ful treatment. If there are many diseased stocks, it is a saving of time to put all the combs having infected brood in them, into a single large hive, without any queen. All brood that does not hatch out, may be then treated without having far to go, or many hives to look after: and as no more brood is reared, the disease cannot go farther. Our German friends recommend giving a weak solution of the acid as a feed to the bees. This may be a good idea, but as I am rather opposed to doctoring either bees or human beings with drugs, to any great extent, I hope you will pardon me if I am a little incredulous in regard to the propriety of such measures.

For spraying the bees and combs, a spray diffuser, kept by druggists, is a saving of time and labor. Those used with a rubber ball are handiest.

CAUSE OF THE DISEASE.

Many reasons have been given for the appearance of foul brood, and it has been sometimes claimed that the disease might be generated by the decomposition of considerable quantities of chilled brood, if left in the hive. I can but think that this is a mistake, and I also think that a great many cases are called foul brood that are nothing like it. The real virulent foul brood does not usually yield without pretty severe treatment, and it is claimed by some, that the worst type of the disease can only be eradicated by a total destruction of the hives, combs, and bees. Very likely there are several types of the disease, and it may be that the milder forms yield without much trouble; but if we admit it to be a fungoid growth, as the best authorities tell us, I do not know how it can originate without the germs or seed being brought by some means, from some locality where it prevails, like small pox, and other diseases of like nature. The theory of spontaneous generation of either plant or animal life has, for ages, over and over again fallen to the ground, when the experiments were made with sufficient care; therefore I think we may feel sure it will never come into our vicinity, unless it is brought in. Some parts of York State, Michigan, Wisconsin, and some other states, have been affected with it so many years, that it is liable to break out at almost any time, and it may be a hard matter many times to decide whence it comes; but if we are prompt, destroying or cleansing all diseased cells the very moment we discover them, I think we need have little fear or trouble. It is quite likely that the evils of

this malady, like the moth troubles, are greatly exaggerated by careless and shiftless bee-keepers. Box hive bee-keepers, even now, will tell the most doleful stories of how the moth has ruined all their hopes and apiaries, while one who is at home with bees knows that the owner is much more at fault than the poor, much abused miller.

FRUIT BLOSSOMS. Although the honey obtained from this source is not equal, either in quality or quantity, to that from clover, basswood, and some other sources, yet coming, as it does, just when the bees have, usually, nearly exhausted their old stores, it is a crop of great moment to the apiarist.³² I do not know of a prettier sight to the bee-keeper, than the yellow banded Italians at work on fruit blossoms, nor a pleasanter sound than their merry hum of rejoicing. One would suppose the honey from choice early cherry trees must be unusually fine, but I believe those who have tried it, all agree that it is anything but delicious. It seems to have a strong rank taste, much resembling the taste noticeable in chewing cherry tree bark, or the buds. The honey from apple bloom is much the same. It is excellent for starting brood rearing, but it is of little or no value for table use. I once extracted about 10 lbs. of honey from fruit blossoms, by putting two fair colonies together early in the spring, thus giving about the working force of a colony in June.

Although it will not be advisable to try to get surplus honey from the fruit bloom, it is sometimes an excellent idea to put a frame or two of sections in the lower story, that they may get the fdn. nicely built out ready for the clover season. If they should store some of the dark honey in the sections, it will all be removed, in all probability, during the interval between the fruit bloom and clover.

July, 1883.—The above statement in regard to apple-tree honey has appeared in print unchallenged, so far as I recollect, since the A B C book was first published, in 1877. During the present spring, however, several have reported apple-tree honey as being fully equal to any; and friend Sanford, of Unionville, Ct., has taken the trouble to send me a tumbler of nice honey from this source, which all who have tasted it declare to be equal to any honey furnished from any source. The flavor is distinctly apple-bloom; that is, one who had ever chewed apple-blossoms would have no difficulty in deciding at once as to its

source. The flavor is not only beautiful, but the honey is very thick and remarkably clear. Whether this result is peculiar to this season, or whether the honey that I extracted and bottled in former years was mixed with honey from the dandelion, hickory, or other sources, I am unable now to say; but this I *do* know, that apple-tree honey is, at least sometimes, equal to any.

DO BEES INJURE THE FRUIT, BY TAKING THE HONEY FROM THE BLOSSOMS.

This is an idea that has been advanced over and over again, and will probably be many times more, by those who take only a casual view. If I am not mistaken, the matter was carried so far in a town in Mass., that an ordinance was passed obliging a bee-keeper to remove his bees to another locality. After a year or two had passed, the fruit growers decided that they would rather have the bees brought back, because so little fruit was set on the trees, in proportion to the amount of blossoms appearing. As it was a fruit growing district, it was a matter of considerable moment, and the bees were brought back. Of course, with the bees, came fruit in abundance, for many kinds of fruit absolutely depend on the agency of bees in fertilizing the flowers, to enable them to produce fruit at all. It seems that the small drop of honey which nature has placed in the flower is for the express purpose of attracting bees and other insects, that the blossoms may be surely and properly fertilized. It has been stated that unless we have a few hours of sunshine when early cherries are in bloom, we shall have no cherries at all; and occasionally we have a season when cold rain storms so prevent the bees from getting out, that not a cherry is produced.

It is well worth while, I believe, for an apiarist to locate near extensive orchards, even if he should not think of planting fruit trees, with the especial end in view, of having his bees benefitted thereby. A large yield of honey from fruit bloom is pretty sure to lay the foundation of a good honey season.

The very best time to transfer bees is when the honey just begins to come in from this source, for they are then all busy and happy, and but little honey is in the way to run down and hinder the work. I have looked at populous colonies during fruit bloom, that had not a dozen cells full of honey in the hive, in the morning, but by night the hive would seem very well supplied; the next day would show the same aspect of af-

fairs, indicating how rapidly they consume stores, when rearing brood largely. Should a stormy day intervene, stocks in this condition will be injured very much, if they do not starve, by being obliged to put the unsealed brood on such short allowance. A friend once came to me, in May, to have me come and take a look at his bees; he said they were sick. It was a box hive, and as I

turned it over, I agreed with him that they *were* sick, and no mistake. I called for a bowl of sugar, and after stirring in some water, I sprinkled it all over the bees and combs. In less than an hour, they were all perfectly well, and he paid quite a tribute to my skill in compounding medicines for sick bees. My friends, be sure that your bees do not get "*sick*" during fruit-blossoming time, nor afterward either.



J. H. MARTIN'S APIARY, HARTFORD, N. Y.

G.

GILL-OVER-THE-GROUND. (*Nepata Glechoma*.) Some 40 or 50 years ago, when this county was mostly woods, my father and mother commenced life on a little farm near where I am now living. Woman like, my mother wanted some flowers around the log house that they called home, and going to a neighbor's a few miles away, she took up various roots and plants. It was just about the time, or a little before fruit trees bloom, and amid the shrubbery, she found a little blue flower, growing on a vine. As blue has always been my favorite color, I can readily excuse her for wanting to take home a root of this humble looking little vine. The vine grew and throve "mightily;" so much so, that when my father moved back to the old

farm after a dozen years absence, he found my mother's blue flower all over, every where, and giving fair promise of being able to choke all the grass and almost everything else out entirely. When "we boys" commenced trying to make a garden, we scolded so about this "pesky weed" that my father said it must be thoroughly "dug out," be-

fore it went any farther. After some feeble and ineffectual attempts at getting it out, he finally offered a younger brother a fine colt, if he would rid the farm of the weed. I do not know how hard he tried, but I believe he never got the colt.

It transpired in later years, that this plant yielded a great deal of honey, and in some localities favorable to its growth, such as the beds of streams where there is plenty of rich vegetable mould, it has furnished so much honey that it has been extracted in considerable quantities. Coming in, as it does, between fruit blossoms and clover, I think it might well be given a place on our honey farm, even if it does hold so tenaciously to the soil when it once gets a start. That you all may recognize it, I give you a cut of roots, branches, leaves and flower.

The honey is rather dark, and I believe a little strong, but if it is allowed to become perfectly ripened, I think it will pass very well. Perhaps the greatest benefit to be derived from it, however, will be to keep the bees uninterruptedly rearing brood, until clover and locusts begin to furnish a supply.

This plant is a near relative of the catnip, which it closely resembles in the shape of the leaf. Both were originally from *Nepata*, in Germany, hence the Latin names, *Nepata Cataria*, and *Nepata Glechoma*. I presume it would be an easy matter to raise this plant from the seed, but I would hesitate some in sending out such seed. It spreads much more rapidly than the catnip, because it catches in the soil like strawberry plants, from the little rootlets shown in the engraving.



GILL-OVER-THE-GROUND.

farm after a dozen years absence, he found my mother's blue flower all over, every where, and giving fair promise of being able to choke all the grass and almost everything else out entirely. When "we boys" commenced trying to make a garden, we scolded so about this "pesky weed" that my father said it must be thoroughly "dug out," be-

GOLDENROD. (*Solidago*). This, in some localities, furnishes the bulk of the great yield of fall honey. It grows almost all over the U. S., and there are so many different varieties that it would be almost out of the question to try to give you a picture of it at all; the botany describes 53 dif-

ferent varieties, and it is common to find a half dozen growing within a few rods. Its name describes it, so that almost any one should be able to identify it. If you see autumn flowers as yellow as gold, growing on the top of tall rods, you may be pretty sure they belong to this family. The flowers are very small, but grow in great masses, sometimes in long racemes, and again in dense bunches. The general characteristics are such that, after a little practice, you can readily identify any one of the family, but to assist you we give the cuts below.

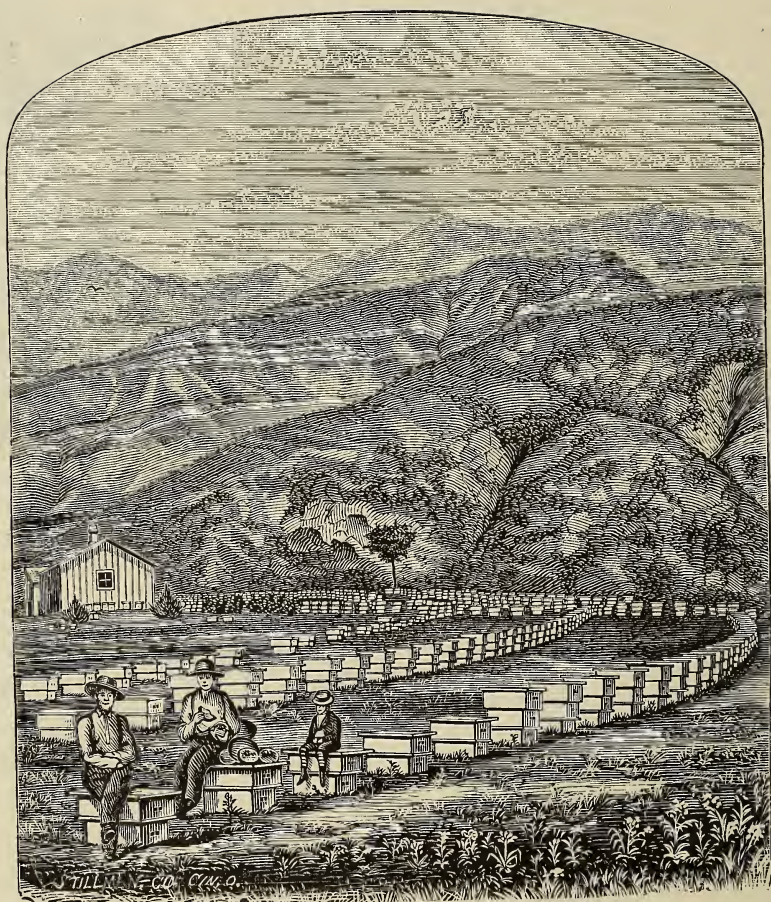
Bees are almost incessantly humming over the flowers in some localities, in others, they seem to pass them entirely unnoticed. I have passed it in localities where bee-keepers say they have never seen a bee on it at all. Bees are seen on it, occasionally, in our locality, but I do not think they get enough honey from it in ordinary seasons, to make it perceptible in the hive.

The honey is usually very thick, and of a rich golden color, much like the blossoms. When first gathered, it has, like the honey of most other fall flowers, a rather rank weedy smell and taste; but after it has thoroughly ripened, it is rich and pleasant. On getting the first taste of Goldenrod honey, one might think they would never like any other; but like many other kinds, one soon tires

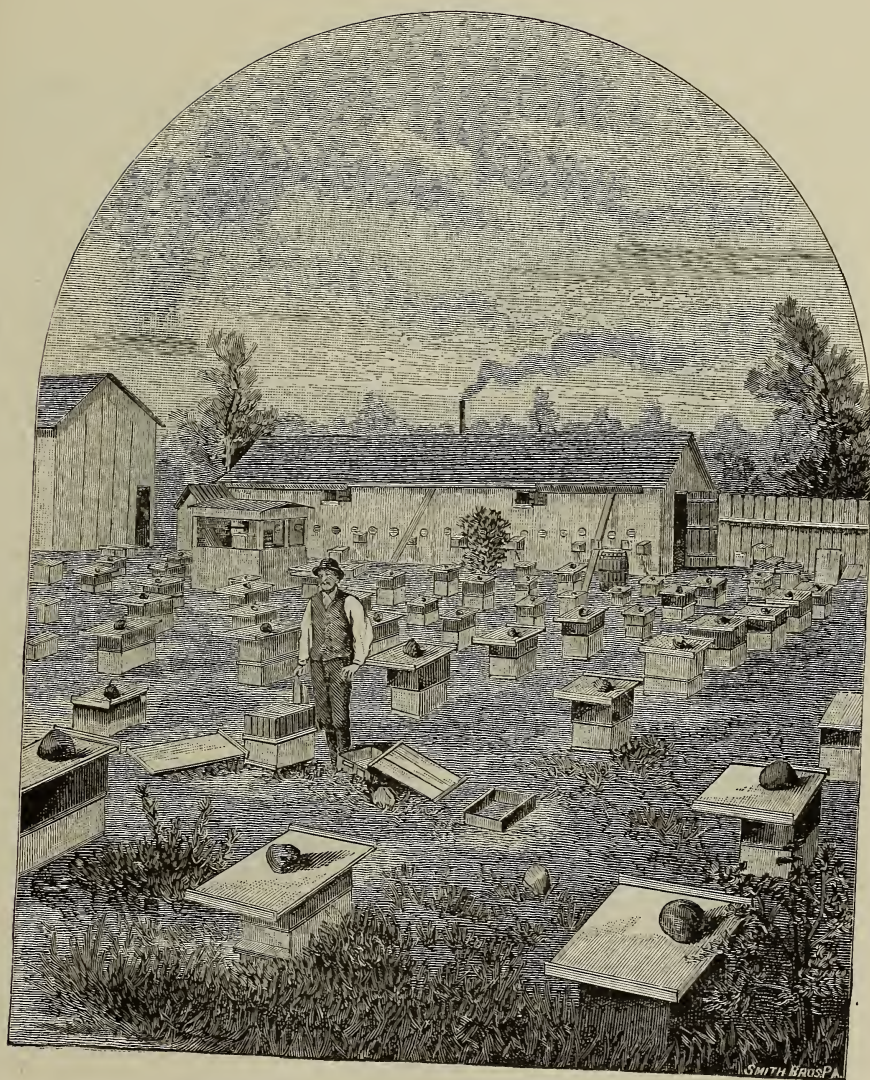
of the peculiar aromatic flavor, and goes back to the clover honey as the great universal staple to be used with bread and butter. A patch of Goldenrod might have a place on our honey farm, and perhaps, with cultivation, it might do better and give a surer crop in all localities; but as it is only a common weed on our farms, I would hardly favor a general distribution of the seed.



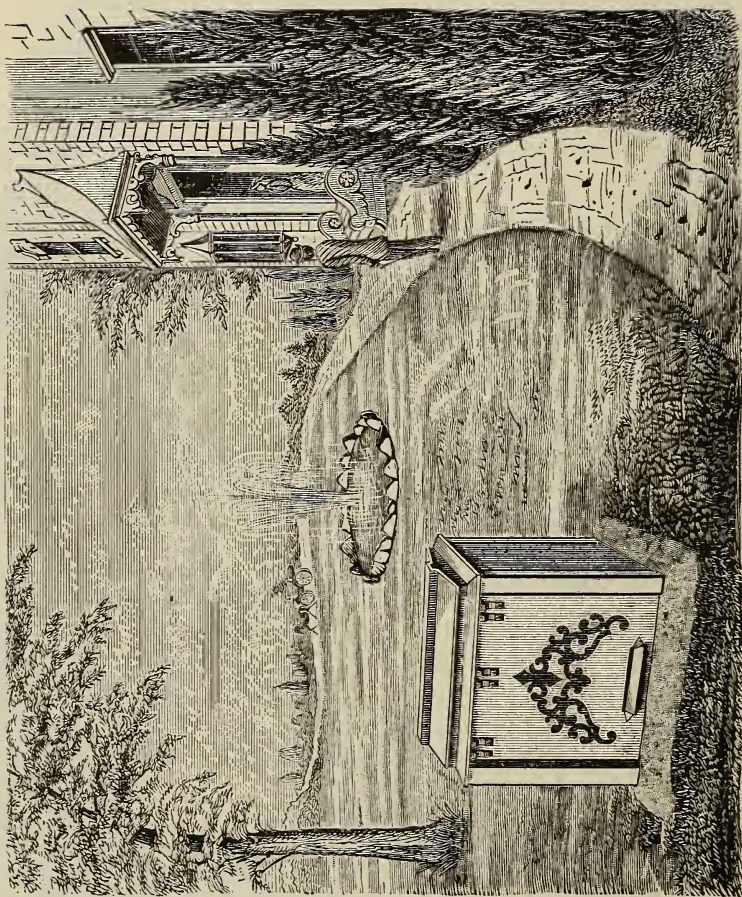
THREE VARIETIES OF GOLDENROD.



COGSWELL'S APIARY, LOS ANGELOS CO., CALIFORNIA.



APIARY OF W. H. SHIRLEY, GLENWOOD, MICH.



THE LAWN OR CHAFF HIVE.



H.

HIVE-MAKING. Although it is very important to have good, nicely fitting, well made hives for the bees, I would, by no means, encourage the idea, that the hive is going to insure the crop of honey. I think, as Mr. Quinby used to say, that a good swarm of bees would store almost as much honey in a half barrel or nail keg, as in the most elaborate and expensive hive made, other things being equal.³³ This is, supposing we had a good swarm, in the height of the honey season. If the colony was small, it would do much better, if put into a hive so small that the bees could nearly or quite fill it, thus economizing the animal heat, that they might keep up the temperature for brood rearing, and the working of wax. Also, should the bees get their nail keg full of honey, unless more room were given them, at just the right moment, a considerable loss of honey would be the result. The thin walls of the nail keg would hardly be the best economy, for a wintering hive, nor for a summer hive either, unless it was well shaded from the direct rays of the sun.

Hives with thick walls, made of some porous material that is a good non-conductor of heat, as well as an absorbent of moisture, have been well proven to have decided advantages over hives made of a single thickness of boards, especially for wintering; but, as they are heavy to move around, and rather more expensive in the start, I think it well to have both winter and summer hives in the same apiary. The single-walled hive which we call the Simplicity, on account of the simpleness of its construction and management, answers almost as well as the winter hives for summer use, and can also be so arranged as to do tolerably for winter; the winter hive which we call the chaff hive, because the walls are made about four inches thick, and packed with chaff, are much the safest for winter and spring, and are also very convenient for summer use, except that they are not easily carried about. These chaff hives are permanently a two-sto-

ry hive; that is, the upper story is not removable, as is the case with the Simplicity hive. On this account, the latter is much the cheapest hive in an apiary, for a single story can be used for small swarms or nuclei, and answers every purpose of a full hive, until more room is needed, and then an extra story can be added or even a third, as the case may require. For these reasons, the Simplicity hive is the one most used, and is always needed, no matter how many chaff hives you may have.

HOW TO MAKE A SIMPLICITY HIVE.

If I were going off on a journey, and should desire a lot of new hands to make some hives in my absence, I should talk to them about as follows.

Boys, I want these hives good and nice, and, to have them so, you *must* be careful. The first thing you are to do is to get some lumber, and, if you can, you would better get white pine. If you cannot get this, you would better use whitewood. If you cannot get that either, get the best lumber that they have for house building, in your locality. For the body of the hive, you want boards just one foot wide. For the cover and bottom boards, which are one and the same thing, you want boards not less than 16½ inches wide. For the narrow boards, we get best barn boards, and we pay for them, at this date, \$24 per M.; for the wide boards, we have to pay about \$28. As soon as you get your lumber home, have it nicely "sticked up." I say nicely, for I do not believe I ever had a boy that would put up lumber safely, unless he was told a great many times. Your lumber would better be 16 feet long, for this length works with less waste than any that is shorter. Now, before you stick it up, you are to prepare a level place for the first board; or rather, you are to have the first board lay straight and flat. If it is to be left out of doors, it should have slant enough to carry off the water. If you have shop room, you can put it in doors. Do not lay the first board on the floor, but have

some sticks under it. These sticks for sticking up lumber should be of an exact thickness, and I think it will pay to provide some that are just right. If you are making many hives, you will have refuse sticks, that will come very handy for this purpose. The sticks should be about $1\frac{1}{2}$ inches wide, exactly $\frac{3}{4}$ thick, and 15 or 20 inches long. A stick should be placed at each end of the boards, and two more between them, so as to make the spaces about equal. Put the sticks exactly over each other, or you will, if you have a large pile, have the boards bent or warped by the weight of those above. When they are all piled up square and true, you can feel safe in regard to them. Even if the lumber is to be used within three days, I would put it up in this way as soon as it is unloaded.

If you are going to make accurate work, you must have your lumber all of an exact thickness; and as it is much easier to talk and write about having it exactly $\frac{3}{4}$ than it is to make it so, I will explain to you a kind of gauge that I had to give the planing mill men, before we planed our own lumber. Below is a picture of it, full size.



GAUGE FOR PLANING LUMBER.

When you carry them the lumber, tell them, if it is planed so that the "too large" notch just fits it, it will have to be planed over again; and that, if it goes into the "too small" notch, it is spoiled. This will soon get them into the habit of having it "just right," every time. Their planers must also be so adjusted, that both edges of the board are *just right*. Since the 18 in. Lilliputians cost only \$75, if you have much work to do, it is, by far, the most profitable way, to have a planer of your own. Then you can set it just as accurately as you choose, and it will pay for itself, where there is work to do, in a few weeks. The usual price for planing is \$1.00 per M., and we can do that amount without trouble per hour, with a $4\frac{1}{2}$ horse power engine. If the lumber is not well seasoned, it may be well to have it planed to the too-large gauge; but this is a very bad way of doing, on many accounts. Get your lumber seasoned as well as it possibly can be, before you commence work, and, if you are *obliged* to use that which is not well seasoned, cut your stuff to the exact length,

then stick it up, and leave it until the very last moment, before you take it to the exact width you wish it. This is, perhaps, one of the surest ways, especially when the work is not all to be sent off immediately. We frequently leave covers in this way, and only bring them to the finishing width the very day they are to be shipped. It is especially needful that the covers be well seasoned, for a season check would let in water, and endanger the life of the colony.

A great many of Barnes Foot-Power saws are in use; therefore I shall give my directions for them, and, if you have different saws, you can modify the directions to suit your conditions.

We will first talk about making the body of the hive. Your pile of one foot boards is to be cut up in lengths of 37 inches. Remember, just one inch more than a yard. To avoid making mistakes, you can cut a stick of just that length. If you have quite a pile of stuff, a gauge that you can push the boards against will be very handy. Always commence at the best end of the boards. If the end is checked or bad, allow a little for waste. Cut off 5 lengths, and leave the surplus of half a foot or more on the last piece; that is, do not cut it off. Pile these last pieces by themselves. You will need an assistant to do this, and if you have a boy or girl 10 or 15 years old, they can help "papa" a "big lot," in making hives.

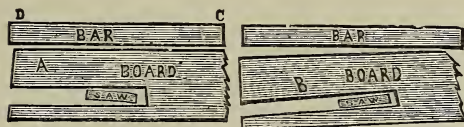
The table of the saws, as it comes from the factory, is hardly large enough to make hives on conveniently, and so we will piece out the stationary side by a sort of a leaf about 1 foot wide. This leaf is easily fastened on securely, by a couple of hard wood strips screwed on the underside of both leaf and table. After your boards are all cut up, you will proceed to bring them to an exact width and straighten one side. As we want the boards to finish $11\frac{1}{2}$, we will trim them, the first time, to about $11\frac{3}{4}$; those that will not hold out this width, can be saved to make frames of. To bring one side straight, you must set the parallel bar at the left of the saw, at just the right distance from it, and then push the boards through, holding closely up to the gauge. Very likely, when you start out, your saw may "run," as it is termed; this may result from two causes. If the teeth are filed longer on one side than on the other, and insufficiently set, the saw will be very likely to run either into, or out of the lumber. This will not do at all, for we can never have an accurate hive, unless we get a straight edge, in the first

place, to work from. Give the saw set enough to make it run clear, as explained in SECTION HONEY BOXES, and have the teeth so that the cut ahead of the saw shows as in the diagram below.



IMPROPERLY FILED. PROPERLY FILED.

A second cause of trouble may sometimes be found in your parallel bar, which must be just parallel, or you cannot have a true straight cut. The diagram will show you the consequences of having this bar improperly set.

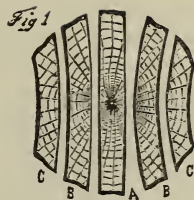


SETTING THE PARALLEL BAR.

In fig. 1, the bar is set so that the board between the saw and the gauge wedges, as it were; and, when this is the trouble, you will see the surface, at A, shows as if it had been planed; this is done by the face of the saw, which rubs or burnishes the wood, as it squeezes past. The remedy is plain; move the end, D, away from the saw a little, or, the other end nearer to it, as may be necessary to preserve the proper distance. In fig. 2 we see the opposite extreme, and, when this is the trouble, you will find it almost impossible to keep your board up against the gauge, for the saw is all the time crowding it off. The piece, B, will constantly be getting too narrow, and the strip that comes off, too wide. Before you attempt to do any work, and thus spoil your lumber, you should test your saw and gauges, on some refuse pieces. When it is all right, the saw should run clear and smoothly in the center of the saw cut, and the stuff should easily be kept close up to the gauge.

While you have been doing this work, the movable side to the table should be taken off, as it is not needed, and would only be in the way. After one edge is trimmed, set your gauge so as to cut exactly $11\frac{1}{2}$, and bring the boards all to this width.

Now, before going further, you are to sort the boards, so as to have the heart side of the lumber come on the outside of the hive. If you look at the end of each board, you can see, by the circles of growth, which is the heart side, as is shown in the cuts.

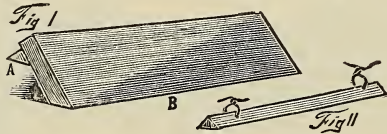


WHY BOARDS WARP.

At B, you see a board cut off just at one side of the heart of the tree; at C, near the bark; at A, the heart is in the centre of the board. You all know, almost without being told, that boards always warp like C; that is, the heart side becomes convex. The reason is connected with the shrinkage of boards in seasoning. When a log lies until it is perfectly seasoned, it often checks, as in fig. 2. You will observe that the wood shortens in the direction of the circles, and but very little, if any, along the lines that run from the bark to the centre. To allow this shrinkage in one direction, the log splits or checks in the direction shown. Now, to go back to our boards, you will see, that B shrinks more than A, because A has the heart of the tree in its center; that C will shrink, in seasoning, much more on the bark side than on the heart side; that this can not fail to bring the board out of a level; and that the heart side will always be convex. You have all seen bee hives, probably, with the corners separated and gaping open, while the middle of the boards was tight up in place. The reason was that the mechanic had put the boards on wrong side out. If the heart side had been outward, the corners of the hive would have curled inwardly, and, if the middle had been nailed securely, the whole hive would have been likely to have close, tight joints, even if exposed to the sun, wind, and rain. This matter is especially important in making covers to hives. If your boards are all sorted with the heart side downward, we are ready to proceed. I say heart side downward, for you want them placed just as they are to be used on the saw. I have seen boys that would turn every board over, just as they picked it up to put on the saw table, instead of piling the whole just as they were to be used. I have seen others that would carry each one of several hundred boards 6 or 8 ft. to the saw, when the whole pile might have been put almost within one foot of the place where it was to be used. It is very awkward and extravagant to do work in this way.

Before we cut these boards into sides and ends, a groove is to be sawed for the should-

er under the cover, and the lower edge is to be beveled, to allow the hives to be piled over each other. The following cut shows a side and end view of the board. The groove, A, is to be just 2 inches from the top B, and is to be $\frac{1}{2}$ deep. This you can easily do by setting your parallel bar just 2 inches from the saw, and screwing the table top up until the saw cuts $\frac{1}{2}$ deep, cutting the groove in the heart side, of course. Now, to take off the three cornered strip at the lower edge, a little different rigging is required. In fact, we must have a table to slide the boards on, and it must set at an angle. This angle we will have 45 degrees, because our table will then be just right for making the corners of the hives. The beveling platform is easily made of a piece of 2-inch plank, 6 inches wide, and $2\frac{1}{2}$ feet long. Take a three cornered piece from the lower edge, and then nail this piece against the other edge, in the position shown by the following cut.



BEVELING PLATFORM.

This piece, A, is to rest directly on the top of the parallel bar of your saw table. When you get it adjusted so that the thin edge, B, fits closely to the table, screw it fast to the bar. This allows the piece to be adjusted upon any spot on the table, and gives us a square mitre to any stuff that may be laid on it while it is being sawed. Adjust the whole at the right distance from the saw, and then take off the corner of all the boards, on the opposite side from which we sawed the groove, as shown at the bottom of C, in the figure at the top of this column. Now remove the beveling platform, and you are ready to cut up the boards. We have all this time been using the rip saw; we will now change and put on the cut off.

I think we would better "oil up," at about this stage of proceeding. I do not know why it is, but I scarcely ever take hold of a foot power saw when it would not be greatly improved by giving it a thorough oiling. It is really a saving of time, as well as of strength, to oil your machinery often. Much time is also saved, in changing saws, by having your saws and wrench close at

hand. The fifteen-cent screw-driver, with a wrench, exactly fits Barnes saw mandrel, and we keep one tied, by a stout cord, to the frame of the machine, that it may be always in readiness. To be obliged to stop your work, and hunt for tools when you are in a hurry, is "awful." You would better fix some kind of a drawer in your saw table, to keep your saws, or they may get down among the rubbish, and be lost. I have known people to lose their cut-off saw, and be obliged to stop and hunt for it; and I should not be surprised, if they scolded somebody who was not to blame at all. I have spoken of having one of the children help by handing you the boards, &c.; if they do, be sure that you make the work pleasant for them. If you lose your tools and scold, you certainly will not make good hives.

You probably have not made any mistakes, thus far; but now, before you commence cutting off the pieces to the exact size, be careful. As you will need a pair of iron frames for putting your hives together, I think you had better have them on hand now, to take your measurements by. If you attempt to measure with a square, you will get it wrong side up or something, and get your gauges set wrong. It was but yesterday, that one of the boys cut up a whole pile of boards to the wrong length, because he looked on the wrong side of the square. For fear he would do something of the kind, I had given him a board just right, for a sample, but some one else wanted it, and so he took the dimensions, and it turned out as I have said. Go to your blacksmith, and get him to make two iron frames like the picture below. They are to be made of $\frac{3}{4}$ inch round iron, and the dimensions, inside, are to be as exactly 16 by $20\frac{1}{4}$ as you and he, both, can make them. When you have, with some trouble, got them nearly right, do not say, that is near enough, but make them exact.



PAIR OF IRON GAUGE FRAMES, FOR HIVE MAKING.

The corners, you must finish out with a file, so that they are sharp and true. For convenience of slipping them over the hives, they are to be made a little flaring, like a barrel hoop; if they are $\frac{1}{2}$ inch larger, each way, on the large side, it will be about right. Now, for the buzz saw. You will observe that the sliding half of the table has a bar bolted to its top, for a square cut off gauge;

this gauge must be set accurately, like the other, or you will have much trouble. It is to be so set, that, when you cut off a board held closely against it, it will be exactly square across the end. You can test this with a good square, but I think I would prefer to take a board with true straight sides; cut off a little, say a half inch; now turn it over, and cut off again; if the strip cut off is of exactly the same width at each end, your gauge is set true. For fear you may not get the idea, I give you a picture.



HOW TO SET THE CROSS CUT BAR.

If your gauge is set right, the slices, C, will be exactly straight; i. e., not wedge shaped, even if you turn the board over so as to cut from the opposite edge at every cut you make. When you are satisfied with this, set your parallel bar, so as to cut the side pieces of the hive to just go into the iron frame length wise, and the end pieces, to just go in cross wise. The 37 inch boards will just make one of each. If you want to test the accuracy of your work, pile the boards on each other, and see if they are all exactly alike all around. I should, right here, suggest that you have your work nicely piled up, all the time, and a couple of willow clothes baskets, set near the saw, will be just the thing to toss all your odds and ends into. One of them should be set directly under the table, to catch all the sawdust. *Do not let a scrap or splinter be thrown on the floor.* Always put them in the basket. It will pay well in dollars and cents, and then, when a visitor comes in, he will say,

"Why, what beautiful work you are doing, and what a pleasant place this is." On the contrary, if you have your lumber all scattered about, and sticks breaking and crashing under foot among your tools, he would be very apt to say,

"Well, I'm glad I do not have to work and drudge through life as that fellow does."

Another thing; if your stuff is scattered about, you will very likely miss some, and, after you have changed your gauges that were set so nicely and carefully, you will have to go and set them over, just to finish the few odd pieces; this second time you will be likely to do it in a hurry, because you are cross about having been so careless, and perhaps this will be the means of making a bad job of the whole lot of hives. *Keep all*

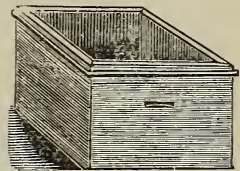
your pieces piled up square and true, and all together, so that none can be missed.

You will remember that we had some longer pieces, that came from the extreme ends of the boards. In cutting them up, you can save lumber, by making two sides or three ends of these pieces, or even two sides and one end, as the stuff may happen to come out.

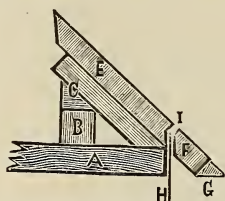
While cutting up stuff, I would have a gauge of the length wanted, right handy, and every little while, just try a board, and see if it is just exactly right. If you have a board that you know is just right, stand it on end, beside the pieces you are cutting, and then pass your finger along their tops, and you can readily see which is longest, if there is any difference.

Our stuff is now all in two piles, and, if we wish to come out even, there should be just as many end boards as side boards; that is, the two piles should be of equal height; as you come pretty near the last, you can manage so as to "fetch up" the pile that is lowest. You will remember that these boards were cut off, so that the short ones just fill the iron gauge frames cross-wise, and the long ones, lengthwise; well, now we are to mitre or bevel the corners, so that, when four of the boards are set up in this shape—see cut—the iron frame will just drive over them.

You will observe that the top of the hive shows that the boards are put together just like a picture frame; and to saw this mitre is our next job. Put on the beveling platform, as before, and, with your cut off saw keen and sharp, cut off a corner so as to leave a sharp feather edge on each end of every board. You can tell when your gauge is right, by the way in which the iron hoop drives over the four boards. If the angle is just right, the corners should close up so as to leave scarcely a visible crack where the joint is. All the boards are, of course, to be mitred at the corners in this way, and then we are ready to take off the strips that go around under the covers. If you will look at the cut of the beveling platform, you will see beside it, a 3 cornered bar with a couple of wires twisted in it. This bar is to be fastened, by the wires, to the planed iron track on which the movable side of the saw table slides, the movable side being removed. Now set the beveling platform so close to



the saw, that you can cut the strip clear off, leaving the desired shoulder, as in the cut.



TAKING OFF THE STRIP UNDER THE COVER.

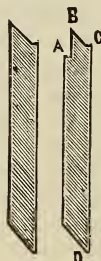
In the above cut, let A be the stationary side of the saw table, B the square end of the parallel bar to said table, and H the saw. C is the beveling platform screwed to B, E the side or end of the hive lying on it, F the strip that goes under the cover, and G the 3 cornered piece that is wired to the iron track. This last piece is to rest the square edge of the board against while pushing it through, to cut off this strip. You will observe that the table is screwed up high enough to allow the saw to cut just into the notch I, that we sawed in all the pieces before they were cut up. Our side pieces are now finished, and the ends are all done, except cutting the rabbets for the frames to hang on. This operation is so simple, it need hardly be described. In the accompanying cut you will see a cross section of

one of the ends that has been rabbeted, and one that has not. We first saw in $\frac{3}{8}$, and then saw down from B, to meet it. As the lumber is $\frac{1}{2}$, if we take out $\frac{3}{8}$, we shall have just a half inch of wood left. When the metal rabbet is in place, and the frame hung in the hive, the top of the frame should be just on a level with the shoulder C. As our frame is just $9\frac{1}{2}$ deep, and we want just about $\frac{3}{8}$ under the bottom bar, making $9\frac{1}{2}$ in all, we want just $9\frac{1}{2}$ inches from the shoulder, C, to the bottom edge of the boards, D. This will insure just $\frac{3}{8}$ between the upper and lower frames when the hives are used with two stories. If our metal rabbets are made to stand just $\frac{1}{4}$ inch higher than the wood, and the projecting arm of the top bar is also $\frac{1}{4}$ inch, the shoulder, A, will be just $\frac{1}{4}$ inch lower than the shoulder, C.

You will observe that I have calculated for $\frac{3}{8}$ between the upper and lower frames, and between the bottom of the frames and the bottom of the hive. Well, $\frac{1}{4}$ inch would be still better than $\frac{3}{8}$, if we were sure the lumber would never shrink by after seasoning so as to make it any less than $\frac{1}{4}$; as it will

shrink some in spite of us, I think we would better calculate on $\frac{3}{8}$. This is also the distance we need between the frames and the outside of the hive, all around; not more than $\frac{3}{8}$, and not less than $\frac{1}{4}$. In cutting out your rabbet, you will, of course, first cut down from A, and I would gauge from D instead of from the sharp edge, B, thus avoiding inaccuracy. When you cut in from B, rest the stuff on the shoulder, C, and you will have no trouble in getting the saw cuts to match nicely. If you have a rabbeting head, you can take the wood all out at one operation, but then you have shavings instead of strips, and it takes a little more power. The strips are of no particular use, it is true, but we find them very handy for sticking up covers, as you will see presently. While I think of it, in the absence of a foot power saw, you can make the bevels and shoulders by grinding a plane in the shape you wish; in this way you can get very nice joints, but it is rather slow business.

The body of our hive is nearly all done except the handles, or rather hand holes that you lift them by; these are made with a wabbling saw. Sometimes our saws have a fashion of "wabbling," just when we would rather they wouldn't, and it would seem to be quite an easy matter to make one wabble: so it is, but, with the Barnes mandrels, it is not quite so easy after all; because they have their saws run on a shoulder that is considerably larger than where the screw is cut. The way in which we make a saw wabble ordinarily, is by a pair of wooden washers like this cut. But the Barnes saw arbor requires that we, after making the washer as above, cut on the side of one of them a shoulder something like this, to hold the saw true. The idea is to have the saw securely clamped between the two wooden washers; to have it clamped so it cannot really slip round, or out of true; I mean by out of true, so that the teeth are just as long on one side as on the other. Unless you have it so, the cavity will be deeper at one side than at the other. The first washer should be thick enough to allow the saw to clear the table, and, as the movable side of the table is adjusted, we can give the wabbling saw all the space it needs. You will need both the parallel and cross cut gauge for this business, and they are to be so set that, when the boards of the hive are carefully and slowly dropped down on the saw, one end at a time, a nice cavity for the fingers will be cut. To

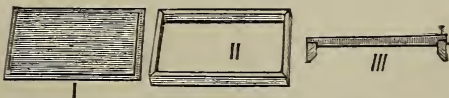


smoothe out the bottom of the cut, you have only to move your board slightly side ways just before you lift it off the saw. This trims off the strings, as it were, left between the saw teeth. I would have these handles made in the sides, as well as the ends, for it is often convenient to lift a hive, when the ends, one or both, are not convenient to get at; for you must remember the simplicity hives can be placed tight up against each other, as there is nothing in the way of so doing.

HOW TO MAKE THE COVERS.

For those you will need pretty good lumber, and it must be of such width that, when fully seasoned and finished, it will be 16 inches; or, to make it plainer, each cover board, when done, must exactly fill the iron gauge frames we pictured on page 104. The length we can manage without any trouble; but the width, taking into consideration how prone to shrink 16 inch boards are, is a little more difficult. If our covers are not seasoned thoroughly, they are very apt to split from end to end, after having the sides nailed as securely as we do it.

I would first cut all the boards in two, in the middle, using a measure, to prevent cutting in such a way as to spoil a cover, and then rip off a strip so as to reduce all to 16½ inches. This gives us one straight edge, and shortens the boards so we can handle them. If you have no assistant, you can cut them in two once more, and this will enable you to handle them very readily. With the straight edge against the cut off bar, cut your boards up carefully to 20½ inches long, or just so as to slip in the iron frame. If your lumber is seasoned as well as you can get it, you may now bring it to 16 inches width, or so it will just squeeze into the iron frame sideways. After this, it is only to be rabbeted. That you may understand perfectly the purpose of rabbeting and cross nailing I will give you some cuts. You remember that we had 2 inch strips from both sides and ends, when we made the bevels on the hive. Well, four of these strips placed in the iron frame, and nailed, will look about like Fig. II.



HOW TO MAKE THE COVER.

Fig. 1 shows the cover board all rabbeted, ready to be pushed into Fig. II. Fig. III is a cross section of the cover, and shows how

the nails are to be driven. If the covers are ½, you will have a half-inch of wood to leave, as shown, after taking out ¾, to get the shoulder; but, as much of the lumber will dress more than ½, and some of it a full inch. I would plane it just enough to get a smooth surface, and no more.

Now, supposing you can not get perfectly seasoned lumber (and, in fact, according to my ideas, the lumber as it comes from the lumber yards is never seasoned as it should be for covers) what shall we do? I will tell you; get out your covers just as I have mentioned, except you will omit rabbeting one edge. Pile the boards up, placing between them the sticks that came out of the hives when we cut the rabbet; or, if more convenient, use pieces of lath, or any strips of an even thickness. Put the sticks close to the ends of the covers, and pile them up clear to the ceiling of your room: the higher the better. Now, when you wish to use some cover stuff, or fill an order, take down as many as you want, and rabbet the remaining edge until the cover just slips into the frame.

NAILING HIVES.

We use 6 penny finishing nails, and put four nails in each side all around the hive. Nail the corners securely, first, and drive your nails as close to the corner as you can, without having the nails split out. Never let the point of a nail show itself, under any circumstances, and do not have any splitting or botch work, if it takes you a whole forenoon to nail up a single hive.

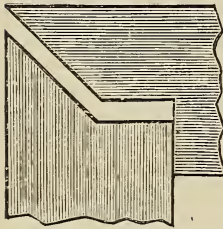


IRON SMOOTH PLANE FOR DRESSING THE BEVELS TO AN EXACT FIT.

To work to good advantage, a pair of iron frames are needed, although you can get along with but one. In your first attempts, it is hardly to be expected that you have been able to get the hive stuff so it will just drive into these frames, and I hope you have been on the safe side, and made your boards a little large, if anything. If such is the case, you are to have one of the neat, little, iron, smooth planes to be had so cheaply now a days, and plane off the ends, until they are just a tight fit. The iron frames will draw them up, so that you can hardly see where the joint is. Now nail them as directed, and cross nail. The cross nails

should come so near each other that they almost touch. We nail down through the cover with 4-penny nails, and cross nail into the end with 6-pennies, as before.

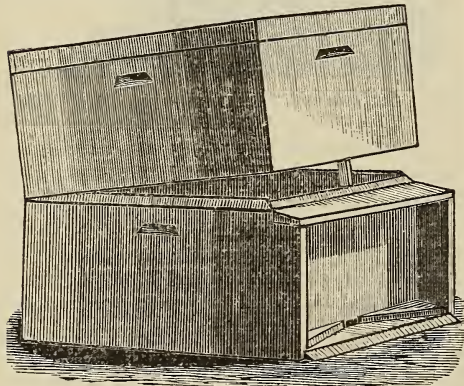
You cannot very well get lumber that will make all the covers so as to be weather proof; therefore we sort out the poorest, and use them for bottom boards. By this means, we have the covers all good, and no lumber wasted. It is for this reason, and that we may have as few separate pieces in our hive as possible, that I advise making the cover and bottom boards all one and the same thing. If you are out of the one, you can use the other, and vice versa. Therefore, the Simplicity hive is nothing but this plain simple body, and the plain simple cover; and, if we make these two pieces just right, we are *all* right.



Since the invention of the mat for covering the frames, we have made the Simplicity hives with the corner joint like the cut opposite. It presents the same finished appearance as the straight bevel, and, with proper machinery, is little, if any, more work to make. It also makes a stronger corner, when thoroughly cross-nailed.

THE SIMPLICITY LANGSTROTH HIVE.

As there are some who insist on having a hive with a permanent bottom board and the old style, Langstroth portico, I have devised such a hive that will take the regular Simplicity for an upper story.



LANGSTROTH HIVE TO TAKE A SIMPLICITY UPPER STORY OR COVER.

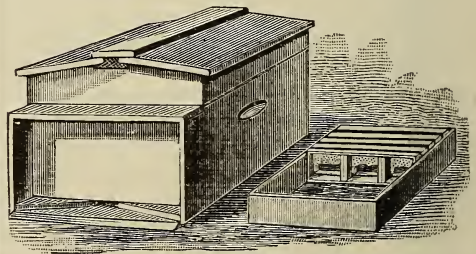
It will be observed that the sides are prolonged to make the portico; the bottom board is also made to project just 3 inches

in front. The sides are made in pairs, and are $23\frac{1}{2}$ inches long, by 11 wide, when finished. The back end is made on a mitre, like the Simplicity; to hold the front end firmly, a rabbet is cut into the sides $\frac{3}{4}$ by $\frac{3}{4}$; to hold the bottom boards securely, and to make a neat looking job outside, a rabbet is also cut in both sides and back end. The bottom board runs crosswise, and is made in two pieces. The portico roof extends over, and is nailed on the top edge of the front end board; it also has a lip or projection on its upper back edge, that makes the bevel around the top. By this means, the front end board is simply a plain board 15 inches long, by $8\frac{1}{2}$ inches wide, rabbeted at the ends to fit into the side boards.

On some accounts, such a hive is desirable, but as it can never be used as a second story, at least, without making holes in the bottom or having the bottom movable, I think I would have the greater part of the hives in the apiary of the usual Simplicity form, both upper and lower story alike. As the entrance is fixed, we are compelled to use the usual 3 cornered movable blocks.

COVERS TO HIVES.

In the old-style L. hive, it has been usual to make the covers to the hives of two pieces. They are tongued and grooved together, of course, but, in our apiary, this kind of covers has made more trouble by leaking, than almost any other. They *will* leak in time, in spite of you. It is for this reason, that I have used one single clear board for covers. But a good many people want a cover with projections; it is pretty expensive to buy clear lumber for covers more than 16 inches wide. In our locality we can not figure such, at less than \$35.00 per thousand.



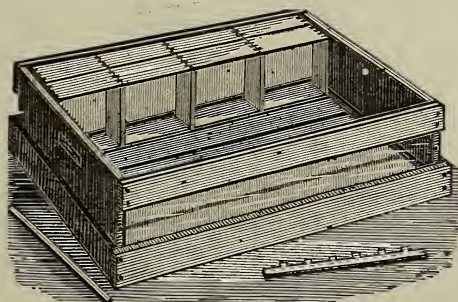
THE STORY AND A HALF HIVE.

Then what shall we do with people who want a cover that won't leak, and must have it project? Narrow boards, 8 or 10 inches wide, are cheap and plenty, compared with wide, clear stuff, and I have devised the cover to the hive shown above. The ridge board is $\frac{3}{4}$ stuff, 5 inches wide, and can be

grasped easily so as to raise the cover with one hand, when the other is occupied. The other 2 boards are $\frac{1}{2}$ inch stuff, $6\frac{1}{2}$ inches wide; they are lapped under, and screwed firmly into, the ridge board before nailing. The rest of the cover is $\frac{1}{2}$ inch stuff, put together like the Simplicity hives.

Another item comes in here. A good many winter bees in the Simplicity hives, with but a single story, and the cover is too shallow for a cushion and breathing room above. By making our new cover 5 inches deep, we get room for a cushion and ventilation; and more than all, it will allow of a single tier of section boxes over the frames, so it is, really, a story and a half hive.

If we use sections over the frames, under such a cover, no bees must get outside the sections, or they would get mashed when the cover is set down.



COMBINED SHIPPING CASE AND HONEY CRATE FOR STORY AND A HALF HIVE.

I have for years thought of a shipping case that could be set right on the hive to be filled, and taken right off the hive and sent to market; but difficulties have always stood in the way, until now. The above has bottom bars to protect and hold the sections, precisely like those on the broad frames, and they are supported by a groove cut along the lower edge of the end boards. Now to space these bottom bars as they lay in the grooves, exactly, so as to match the bottom bars of the sections, we use a spacing strip shown in the engraving, below the case. This strip, when pushed down in place, also holds the separators at just the right height. The sections are closed tops, and when they are all in place, a thin strip is pushed down so as to rest on the top edges of the separators, and hold the boxes firmly upright, and in place. A strip of glass runs along each side, which allows the apiarist to see how fast the bees are working, by simply raising one side of the cover to the story and a half hive. See sections, etc., on page 120.

If the central sections are capped first,

separate them in the middle, and swing them around, so that the finished ones will come next the glass.

HOW TO MAKE THE CHAFF HIVE.

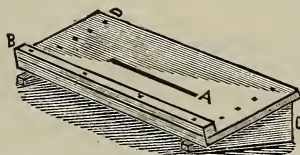
This is all, except the corner posts, made of cull lumber, which can be purchased at any lumber yard; we get it for \$10. per M. Get it long enough before hand to have it piled up and seasoned, if you possibly can; if you cannot, you must manage to have the stuff piled up so as to season after it is got out; it will season very quickly in these thin narrow strips, and so we often cut it up, unseasoned, when we are behind on orders. Fix your table, as before directed, and cut your whole pile of boards, before being planed, into pieces two feet long. If you do not cut them all so exact, it will not matter a great deal for this hive, as you will presently see.

After your boards are all cut up, put on your rip saw, and split them up 3 inches wide; but instead of cutting them square, cut them on about the angle shown below.



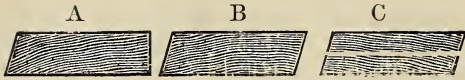
HOW TO CUT THE STUFF FOR SIDING.

If you find any bad knots or shakes, do not split them, but pile them up nicely at one side, to be used as rough bottom boards. This ripping can be done either on the foot power saw or with the Hand Ripper; we use the latter, and I think it does the work more rapidly. To cut the pieces on the bevel, you are to screw a bevel shaped piece on the saw table.



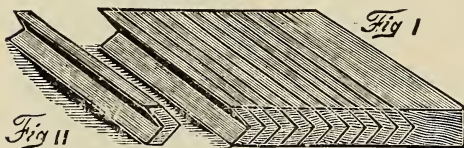
PLATFORM FOR GIVING THE SIDING THE PROPER BEVEL.

Two wedge-shaped pieces, of which only one is shown at C, are used to give the board the proper inclination; the other one is supposed to be where you see the nail holes, at D. A is where the saw comes up through, and B is a square bar that the edge of the rough lumber is rested against. It is fastened to the table by screws put through the table top from the under side into these pieces C. With the Hand Ripper, we screw the two pieces fast to the two light wooden bars that constitute the only wood about the machine.



The first piece that comes off, will be like A; turn it over, and run it through again, and it will be like B; the next operation is to split each piece, like C. This you will have to do with the Hand Ripper, for the foot power saw would not reach through so far. If you do not split the pieces exactly in the middle, it does not matter, and a very thick one occasionally will be all the better, to give the hive strength without extra expense. You can plane this siding by hand very cheaply, or it may be done on the cigar box planer; if on the latter, you will be obliged to reduce them to a uniform thickness unless you choose to save out the thickest pieces, and plane them afterward with the planer a little higher. Plane only the one side just left by the saw. If you are not going to use this siding at once, pile it up crosswise, as coopers do their staves, until it is thoroughly seasoned and straight.

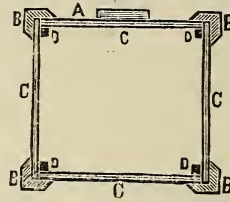
Our chaff hive is built by nailing these pieces of siding to corner posts with planed side outward, of course. As nails have a fashion of drawing out when exposed to the sun, (some carpenters say the sun pulls them out,) we will drive them all from the inside, and then, if "Old Sol" tries to pull them out by the feet, he will have a tough job, and will only draw the heads up tighter. The corner posts that we use are made of solid wood, and are cut from 3 inch plank. The plank should be so clear from knots and shakes, that there will be no danger of the pieces breaking while nailing into them. Cut your plank, which should be as wide as you can get it, into pieces 22 inches long. Now with the beveling platform that I showed you in hive making, you are to cut out the corner posts in this way:



HOW TO MAKE THE CORNER POSTS.

You will observe that the saw goes in at each side until the cuts meet, so as to take out pieces like fig. II. After you get them all out, you are ready to nail up the outside of the hive. Lay two of your corner posts, as shown above, on your work bench and have them 2 feet and $2\frac{1}{2}$ inches apart. To get these dimensions without measuring, I

would nail a couple of strips to the bench just the right distance apart; also a third across the end, that we may always have the hive square and true. The chaff hive is not quite square; it is 1 inch narrower on the side where the entrance is; therefore, when you are nailing the back and front, you are to slip a strip of wood 1 inch wide between one of your posts and your stop. Our siding, you remember, is just 2 feet long; well, the pieces on both front and back go clear up into the corners of the corner posts. This will prevent the side strips from coming clear up by $\frac{1}{2}$ inch, as shown below.



EXTERNAL SHELL, AND CORNER POSTS OF CHAFF HIVE.

A is the entrance, B, B, B, B, the corner posts, and C, C, C, C, the siding. Now after we have got the siding nailed securely with the beveled edges so arranged as to keep the rain out of the chaff, we will nail in each corner an inch strip, shown at D, D, D, D; these are put in with heavier nails, and lock the whole structure most securely.

As there is no need of uncovering the chaff part when we uncover the hive, we make the cover so as to extend over the interior only, and have a permanent cover over the space containing the chaff. This permanent cover is our next piece of work. Get out some long strips, just as you did the siding, only have them $\frac{1}{2}$ inch wider, preserving just the same bevels on each side. Plane it on both sides down to 7-8, and then cut out a part as shown in the diagram.

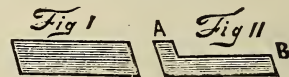


Fig. I shows the piece before taking out the strip, and fig. II, after it is done. You are to cut in $\frac{1}{4}$ inch at A on the same bevel as the sides, and then $2\frac{1}{4}$ at B to meet the other cut. Now turn your cross cut bar at an angle, just as if you were going to make a picture frame, and make a picture frame in reality, of the stuff shown at fig. II. The inside dimensions of the frame must be just $19\frac{1}{4}$ by $20\frac{1}{4}$; you must be very exact about the $19\frac{1}{4}$, for the frames will not have the right play, otherwise; that you may get the

proper idea, I will give you a diagram of this frame.



FRAME THAT HOLDS THE COVER.

To make the joint water tight at the mitres, a saw cut is made in each end of each piece as shown at A, and after the frame is nailed at the corners, a strip of tin is pushed in. The outside of this frame will probably be a trifle large.

This rim, when nailed true and square, is to be fitted to the tops of the corner posts; the posts can be given the proper bevel, with the circular saw, before the siding is nailed on. This bevel is the same as that of the siding. The top pieces of siding are to be of pretty good thickness, that we may nail this rim securely to it, as well as to the posts. It may be well to state here, that the top pieces of siding are nailed on first; 7 pieces, of the dimensions we have given, form the hive. Before nailing in the last piece, you are to cut the entrance in the upper edge. This entrance is to be 8 inches long, by $\frac{3}{8}$ wide. The cut below will make it plain.

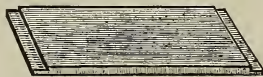


Having now completed the outer shell, we will see about the inside.

INSIDE OF CHAFF HIVE.

This, as well as the outside, is all made of cheap cull lumber. I would, by all means, advise getting out your boards a little wide, and sticking them up until thoroughly seasoned, as I have mentioned before. Cut your stuff in two in the middle, so that you can handle it readily, and then, with the Hand Ripper, rip the boards $\frac{1}{4}$ inch wider than you need, and cut them up to the exact length. When this is done, and your boards are all piled up square and true as before, you are ready to split them through the middle. It is not necessary that the boards be planed on more than one side, for the back side of all of them is next the chaff, and as the rough surface would tend to impede the circulation of currents of air, I do not know but that I would rather have them unplanned. Neither is it important to have the boards split exactly in the middle; in fact, one end I had in view, while inventing this chaff hive, was to avoid the necessity of having to be so exact, as we must be with hives where both inside and outside are exposed to view. You see as we go along, that while the in-

side dimensions of the hive are to "a dot," the boards constituting it may be of all sorts of thicknesses, and lengths too, or at least a part of them, for nearly all the joints are lap joints. As before remarked, it is very important that the back and front of the hive are at the right distance apart, and this proper distance is $18\frac{1}{2}$ inches; to insure this every time, we make the side boards with shoulders as shown below, $\frac{1}{2}$ by $\frac{1}{2}$.



ONE OF THE SIDES OF THE INSIDE OF THE CHAFF HIVE.

It will be observed that four of these boards are used, two above, and two below, $18\frac{1}{2}$ inches from shoulder to shoulder.

The width of these boards, when finished, is to be just $9\frac{3}{8}$ inches, by about $19\frac{1}{2}$ long. We will cut the shoulders on the planed sides, of course, because they come inside of the hive. The ends are of unequal length, for the upper story contains a greater number of frames than the lower. The bottom ones are $14\frac{1}{2}$ in. long, and the upper ones, $20\frac{1}{2}$ in.; both are 9 in. wide. In the Simplicity hive, we were obliged to cut a rabbet into the upper edge of the end boards; but with these, we simply nail the tin rabbet directly

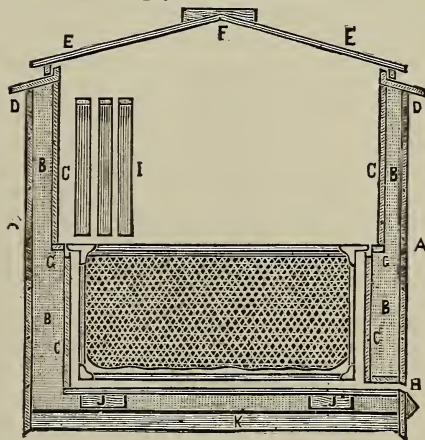


DIAGRAM OF CHAFF HIVE.

on their upper edges. The rim before mentioned, forms the back to those in the upper story, and a strip, nailed on to connect the two stories, forms the back to those in the lower story. This inside work is all made of $\frac{1}{2}$ or $\frac{3}{8}$ inch stuff. The bottom of the lower story is also made of this same thin stuff, and in nailing it on, it does not matter, if the boards lap over and project at both the sides and ends too. The diagram above, a transverse sectional view

of the chaff hive, will, I think, make it all plain.

Both the outside and inside are nailed up separately, and then they are put in place, and nailed together, the only points of attachment being the rim which rests on the top edge of the upper story, and the bottom of the lower story, which rests on a couple of strips that are attached to the siding on either side, and to which the bottom is nailed. Let A A represent the siding, B B B B the chaff, and C C C C the light boards that constitute the inner hive. D D is the rim that holds the cover, and E E the cover itself. F is the ridge board, that holds the siding of which the cover is made. G G are strips about $1\frac{1}{4}$ inches square, that support the upper story, and attach it securely to the lower one. The shelf or ledge, formed by making the upper story broader than the lower one, is exactly on a level with the top bar of the lower frames, and therefore the upper tier of frames must hang just $\frac{3}{8}$ of an inch from these, to prevent, as much as possible, the building of combs between the two. H is the entrance, which is simply a covered passage way from the inside hive, through the chaff, to the outside. A frame is shown in place in the lower story, and the ends of three of them in the upper story, hanging at right angles to those below. J J are two heavy pieces of rough unplanned stuff, that support the bottom of the inside hive. Just below these, is the rough bottom of the hive, which is made of the knotty and shaky pieces that were rejected, when we were getting out the siding. To keep out the dampness of the ground as much as possible, as well as to discourage mice from any attempt to get into the siding, we put a sheet of tarred building paper just under J J, and between them and the rough bottom boards. These rough bottom boards are the last thing put on; when the body of the hive is all finished, it is turned bottom upwards and the chaff filling put in. The chaff may be either wheat or oats; it has been suggested that wheat would be less liable to get damp and settle down so as to be soggy and mould, but we have noticed no such trouble with either kind as yet, and the oat chaff is probably the warmer, because it is softer and more downy, like feathers. The chaff should be packed sufficiently to prevent it from ever settling so as to leave the upper portions of the hive vacant. When the chaff is all nicely filled into the sides, you are to put as much over the bottom as possible and have the tarred paper and rough bottom

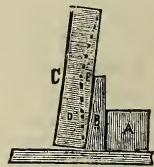
boards go in, and then the whole is to be securely nailed, both down into the strips, J, and through from the siding, into the ends of these bottom boards. Now we are ready for the cover.

To contrive a light cheap cover, that would be absolutely water proof, that would allow of being readily lifted with one hand, and still afford a flat place on the top for setting a case of section boxes, or any other article used in the apiary, caused me more hard study and experiment than all the rest of the chaff hive together. There are a great many different pieces to the chaff hive, it is true, but these pieces are all made of cheap lumber, and one kind of pieces is made to answer a great variety of different purposes. For instance, the roof boards of the cover are all sorted out of the same siding that is used for the body of the hive. Before piling this siding away, you are to select all of the poorest and knottiest pieces for these covers. For the sake of lightness, we will plane these down to $\frac{3}{8}$, or a little less. Where we get hold of very thick stuff among our pile of culls, we can often make 3 roof boards of a piece, thus saving lumber, and time in dressing it down. Now these boards or strips are to be bent in the middle, to get the slope to the roof; and, to do this, we will make a broad saw cut nearly through each of them, as shown below.



ROOF BOARD TO CHAFF HIVE.

Make the cut so nearly through, that the board will bend along the line, without trouble. To keep them bent just right, and to make a solid ridge board with the flat place on top, we will get out a piece of $\frac{3}{4}$ stuff, $23\frac{1}{2}$ inches long, and 5 inches wide. Fix a beveled piece against the parallel bar on your saw table, so that you can cut out this board thus:



Let A represent the parallel bar, B, the beveled piece screwed to it, C, the ridge board we are making, and D, the dotted lines where we wish to have the saw cut. After going through on one side, the board is to be turned over, so that the piece, E, is taken entirely out at the second cut.



COVER TO CHAFF HIVE, READY FOR THE TIN SHEETS,

To make these cheap roof-boards water proof, we will cover them with tin. Get 12 x 24 roofing tin, which will cost, at present prices, about \$12.50 per box. Two sheets are required for a cover. Notch out two of the corners to each sheet, $\frac{3}{8}$ x $\frac{3}{8}$; fold three sides of the sheet at right angles, $\frac{3}{8}$ of an inch, and it is then just right to put on the covers, if the covers are as they should be. The tin is nailed fast only in the edges of the eaves and along the gable ends, no nails being on the top side of the cover. In our picture of the cover, the ridge-board is represented in place, but it is not to be put on until after the sheets of tin. It is put on the last thing, and held by nails from the inside, none of them being allowed to come up through. This tin cover is to be painted like the rest of the hive, and, so long as it is kept painted, the tin will last unimpaired.

As the rim that holds the cover is on a bevel, we wish the strip that goes under the eaves, as well as the gable end piece with the ventilating hole in it, to be beveled at their lower edges also; the former we make of thick pieces of siding, by splitting them in two on the proper bevel. As these are to hold the nails along the eaves, they should be at least $\frac{3}{8}$ thick. For the gable ends, we adopt a little different line of management, and, as the principle is a very important one, I will take a little space to explain it.

Much time is occupied in handling all these little bits of lumber, and to employ a strong man to handle little bits of pine, and turn them end for end, when he could, without fatigue, handle a dozen or a hundred just as well, is something that should be avoided as much as possible. The same idea is brought out very strongly in making section boxes; but to make irregular forms is a little more difficult. Even if we can accomplish no more than to have two of the pieces attached, so that the workman can perform two operations on them, while the stuff is right in his hands, it is quite a saving. This gable end piece, you see below.



GABLE END TO CHAFF HIVE COVER.

You will notice, that each piece has a tapering cut at each end; that it has a bevel at the lower edge; and that it has a hole bored through it. To pick it up and lay it down for each of the four operations, especially, if you are one of the awkward kind that have to turn around and stoop over every time they lay a piece down and pick another up, requires a good deal of time.

If we should take a piece of 3 inch plank, we could cut the tapers, and bore the holes, in at least *six* pieces at once, for they need not be over $\frac{3}{8}$, and then we could saw off the pieces after all was done. But 3 inch plank is pretty expensive, because there is so little demand for it. If we can buy 2 inch plank at a low figure, it may do to use this, but, even if we do, after boring the holes and cutting the tapers, we would better cut them in two in the middle first, so as to have about inch pieces, as you will see. Very likely, it will be best to use your culls, so we will get out a piece of inch stuff planed as thick as it will work, 5 inches wide, by 22 $\frac{1}{2}$ long. This piece will make 4 gable ends, by running your saw through the dotted lines, as shown below.



HOW TO MAKE THE GABLE ENDS.

First we take off the corners. A A; then bore the holes; next we cut from B to C and from D to E; lastly, split them through the middle, and they are finished all but planing. The ventilating hole should be about 1 $\frac{1}{2}$ inches in diameter, and should be covered with wire cloth, on the inside. It is never safe to omit these; for a strong colony will exhale so much moisture from the breath of the bees, as to cause drops of water to hang on the roof boards, and large icicles to form in the winter. I have wintered bees in the chaff hives, without the ventilating holes, but was obliged to open them occasionally during very severe weather, to let the roof and cushions dry out.

FRAMES FOR HIVES.

The frames to fit the hives I have described, are 17 $\frac{3}{8}$ by 9 $\frac{1}{2}$. I took these dimensions from a frame Mr. L. sent me several years ago, in answer to an application to him for a frame of the dimensions he would prefer. Although some of the frames in common use, called the L. frame, differ somewhat from these dimensions, yet the frame will fit the greater number of hives in common use, known as the L. hive. There is some difference of opinion in regard to the comparative merits of frames with metal supporting arms, and those having the top bar prolonged at each end, so as to form a support. I decidedly prefer those with the metal bearing, as being more easily handled, even at the risk of having them slip about once in a while, when we do not

want them to. I want a frame so "movable," that it can be picked up at any time, with one hand even, in spite of all the propolis the bees can fasten to its attachments to the body of the hive. The all wood frames have considerably the advantage in cheapness, and they can be got up on short notice, with very little machinery.

It is a very important thing to have all our frames, as well as our hives, exact in size, and to insure this, we have gauges made for each separate part. We formerly used wooden gauges, but after long use, we find there is danger of inaccuracy from the shrinking and swelling by changes of weather, or loosening of joints by use, and we have, therefore, decided on steel gauges, which we make of a cheap carpenters' squares, such as are to be had at almost any hardware store. The stops are made of brass, and are put on with rivets, as there is always more danger of a solder joint giving way, than of a riveted one. The drawing below will make it all plain, I think.



GAUGE FOR FRAME MAKING.

The plate on the end is put on that end of the square that reads one inch, thus enabling us to read the dimensions in inches, at the same time that we are trying a piece of board to see if the length is right. One side of the square gauges the top bar, and the other side, the bottom bar. The notch in the side gives the length of the end bars. For frames, we use box lumber that costs about \$30. per M. A cheaper quality would answer, and we might work cull lumber to quite an advantage, were it not that there would be great danger of bad pieces getting in, and we really need the very best straight grained pine for our frames, both brood and section, that we can get. For the metal corners, the lumber is to be planed just $\frac{1}{4}$ of an inch; after trying frames with the bars of almost all widths, I think I would prefer this to any other width. Square the end of your board with the cut off bar, and then set the parallel bar at such a distance, that the pieces cut off will be of such length, as to just push in between the stops on your gauge. Do not say, when you have it nearly right, "That is near enough," but have it just as nice a fit as it can be; then you can go on cutting up your boards, without any fear of inaccuracy. For metal-cornered frames, you have only to cut off two lengths; the longest for tops and bottoms, and the shortest for ends. If you are making the

all-wood frames, the top bars are to be $1\frac{1}{2}$ inches longer than the bottom bar. This allows a projection of $\frac{1}{4}$ of an inch, for the frames to hang on. This I think as great a length as we ever need, and I do not think it advisable to try to get along with anything less, if we wish to avoid the effects of propolis in bee-hive manipulations. A bee can pass freely through an opening of $\frac{1}{4}$ of an inch, but if it is much less, he is disposed to bridge it across with propolis; if it is much greater, combs will be built in the space. For these reasons, comb frames are usually separated from the sides of the hive, about $\frac{3}{8}$ of an inch. Well, if we do not want the bees to fill up the rabbet with propolis, we must have a channel for them to walk in, about this width; and $\frac{3}{8}$ outside of the rabbet, added to the $\frac{3}{8}$ inside, gives us just $\frac{1}{2}$ for the projecting arm.

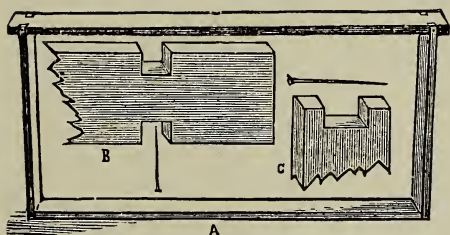
I would put the frames together, at the corners, with the grooving saws, such as we use for section boxes. In the $\frac{1}{2}$ stuff, I would have four grooves and four tenons, as shown below.



This work is very rapidly done with four saws having collars between them, to separate them just the right distance. The boards, when cut up into lengths, are then run over them, being held at the right depth by gauging the height of the saw table. Where the four saws are not at hand, this grooving may be done, but of course not as rapidly, with a single saw cutting one groove at a time. To get the distance just right, a blade, or track, is set in the table, by the side of the saw, just large enough for the grooves to slide over. The first groove is cut, by running your boards against the side of the track, as a gauge, and the next, by running the groove on the track, and so on. This method is more liable to inaccuracy than that with the four saws, yet very nice work can be done by means of it, and we are not limited to any size of stuff, or material. Section boxes, or boxes for a variety of purposes, may be made with this kind of dove tailed corners, with great facility. Great care should be used, to have the stuff held closely down to the table, that it may be all grooved to the full depth. An ordinary saw, with the teeth set very wide, will answer for this grooving, but a thick saw made on purpose, ground thinner in the center, so that it may be sure to clear well, is much better. Cutter heads will do for a

small amount of work, but having only two teeth instead of many like a saw, they are so quickly dull, that I would much prefer the saw. For the metal-cornered frames, I would have all the corners made as above; the grooving in the top of the ends is to be made a little deeper, to accommodate the extra thickness of the top bar. The top bars, we rip off 5-16, the ends and bottom bar, 7-32. The bottom bars would do just as well $\frac{1}{2}$, were it not that heavy combs are sometimes made to rest on them, as in transferring, etc. For the wired frames, shown on page 47, 7-32 will be heavy enough all around, the comb guide being omitted.

Where the frames are made all of wood, I would make them as in the cut shown.



If they are made so as to drive together just right, it gives a very stiff frame, and but a single nail is required to fasten the corner. Care should be taken that the neck on the ends of the top bar is not cut too deep, else the projection may be in danger of breaking off, at the narrow point. The neck should be so made, as to have about 7-16 of the wood left; this will allow the mortices to be just 7-32 deep, and the same in width. We make these with a grooving-saw, with a cut-off saw, same diameter, clamped closely on each side of it. It is made in the boards before they are cut up. The mortice in the ends of the top bars, we make by placing the four grooving-saws close together, the washers being left on the out-sides. Cutting in the end of the wood is rather trying work, for both saws and cutterheads, and they will need sharpening often. Great care should be taken, to have all these joints just right, for the strength and beauty of the frame depends on having them driven up as tightly as may be, without splitting the wood. The comb guide, for both kinds of frames, we make of nice straight grained pine, 9-16 wide, and just thick enough to fill closely the groove cut by one of these grooving saws. This is a little less than $\frac{1}{4}$ of an inch; for you will remember that four grooves and four tenons make just $\frac{1}{2}$ of an inch. The groove is to be

exactly in the centre, and $\frac{3}{4}$ deep, and is, of course, made in the end of the board before the pieces are ripped off. The top bar is also to be grooved on the under side, its whole length. Below we show you a section of both top and end bar, with the groove to hold the comb guide.



As the comb guide is 9-16, and the cut in the end bar $\frac{3}{4}$, we have 3-16 left for whole wood in the top bar, as at A, and the table should be so set, as to leave just this amount of wood uncut.

Even if the fdn. is fastened in the frames with melted wax, as many do, I would have such a comb guide, because it adds so much to the strength of the frame, and obviates the necessity of having a very heavy top bar. The bees will, in time, build their combs right over such a comb guide, and use the cells above the brood for honey.

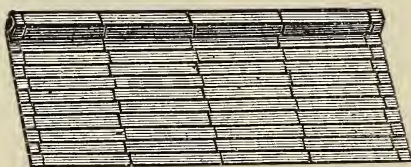
HOW MANY FRAMES IN A HIVE.

You will remember that the width of the Simplicity hive inside, as well as the lower story of the Chaff hive, is just 14 $\frac{1}{2}$ inches. Well, this space is just right for ten frames, bringing them a trifle less than 1 $\frac{1}{2}$ inches from each other, from centre to centre. After we have our frames placed in the hive, and spaced with the eye and fingers, so as to have about the same amount of room for each frame, we are to consider what is to be used to keep the bees down on the frames, and to prevent them from building their combs clear up against the cover, and fastening the latter down with propolis.

WHAT TO COVER FRAMES WITH.

This is a very important matter, and one that must be carefully attended to, or there will be no end of "troubles." If the bees get up under the cover, they will daub the whole inside with propolis, waxing all joints and crevices, and making it almost impossible to lift the cover without jarring and endangering them. They will also use this space for a loafing room, if no surplus boxes are on, when we want every bee down amid the brood combs. Worst of all, when the cover is replaced, bees will be sure to be in the joints where they will get crushed, and when you have to kill bees in opening and closing your hives, you will very soon discover that there is something radically wrong somewhere. Cloth sheets and quilts have been used for the past few years, and

in many respects they are far ahead of the honey boards formerly used. For the past two years, I have recommended and used enameled cloth, with a strip of tin folded in the ends. This has given excellent satisfaction, but two faults have developed with its use. In time, it gets soft by the dampness of the hive, and then the bees gnaw holes in it as they do in the duck. The next is that it is hard to make it stay in its place and perfectly close the top of the hive, unless we use the tin ends mentioned; with these it can not be folded up so as to cover a smaller colony, and it is awkward to use with the division boards now so generally employed. I have just now (March, 1879) devised the mat shown below.



MAT FOR COVERING THE FRAMES.

The great beauty of it is that while it can not shrink so as to let the bees out at the ends or sides, it can be rolled back, folded smaller, and adapted to the varying sizes of the hive with a division board, even better than any cloth. After it is placed so not a bee can get above it, as it is nearly level with the top of the hive, every bee that does not get off, can easily be brushed off and made to go in at the entrance. The strips are of basswood, and are 1-16 by $\frac{1}{2}$ inch. They are woven in a loom, with hard hemp twine.

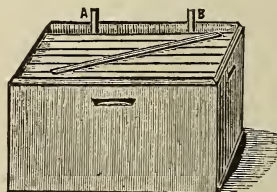
In cool weather or in winter, the chaff cushion is always to be used over this mat, for it is not to keep the bees warm, but only to keep them down, and to protect the cushion above it.*

HOW TO USE THE BROAD FRAMES OF SECTION BOXES.

For the one story hives, you have nothing to do, but to just hang the frame of sections in the hive. The separators, of course, will be turned toward the brood, and this will serve to keep the bees from putting pollen in the section combs, as well as to keep the queen out. I have never seen any pollen, or any eggs, carried into a frame of sections, where separators were used.

Although you can get nice honey from a one story hive; I would not, as a general thing, recommend them; because almost

any swarm of bees will very soon need more room, and if it is not furnished, they will be pretty sure either to swarm or to lie idle, for want of it. With the extractor, we can get along very well with one story, for we can extract the honey; but we cannot well take off the sections, until they are capped over, and when the two frames are full and ready to cap, the bees will have little or nothing to do. This is why I would have a two story hive. If you have the upper story filled with sections, I do not know that there is any particular advantage in having any sections in the lower story at all; for, after the bees once get to working well above, they will, as a general thing, rather neglect the lower ones. Different colonies work differently in this respect, but side storing, unless in hives with taller frames than the L., has been pretty generally abandoned. You will remember that the Simplicity hive is $14\frac{1}{2}$ inches wide, and that the broad frames to hold the sections are 2 inches wide; therefore 7 of the latter would fill the hive into about $\frac{1}{2}$ of an inch. Well, as we wish the tin separators to lie as flat and smooth as possible, we will wedge up in this $\frac{1}{2}$ inch, to bring the seven frames as closely together as possible, and then, when the wedges are removed, we can get out the first frame of sections without any trouble. As the tops of these frames are tight together, we shall have no occasion to use the sheet of enameled cloth, and this may be laid away until the season of surplus is over. It is true, the bees will get above through this $\frac{1}{2}$ inch space where our wedges are put, but we will stop this by a thin slip of wood, similar to our comb guides, only a little longer. Only two wedges are required to hold the broad frames tight up to each other, and these are towards the middle, just opposite the up-rights of the section boxes, between the separators and the sides of the hive. The diagram below will illustrate it.



HOW TO WEDGE UP THE FRAMES OF SECTIONS.

A and B are the wedges. When they are withdrawn, you can pry over and lift out the frame, almost as easily as any brood frame, and the operation of taking out the honey is a very easy, and a very simple one indeed.

*Sept. 1880.—After a more extended trial of both mats and enameled sheets, I greatly prefer the latter, especially where bees are to be handled much, as in queen-rearing.

At first thought, it seems a little singular, that the sections are much easier to take out when filled than when empty; but such is, nevertheless, the case; for they are then rigid, solid blocks, instead of the frail structures which were put in.

PAINTING THE HIVES.

After the hive is nailed, the nail heads should all be set in slightly with a suitable nail set, and then I would advise going over the corners and all rough places, with a keen and sharp smooth plane, set so as to cut a very light shaving. After this, rub off all rough places with some sand paper and a block, and you are ready to give it a priming. This priming may be simply boiled linseed oil, or boiled oil and ochre, or something of that sort. Cheap red paint is said to hold better than any other color, but, for the sake of avoiding the consequences of excessive heat, I would avoid all dark colors, even for a priming; for somebody might be careless, and let the paint wear off until the priming showed through, and then, if the heat of the sun should strike right on the hive, the little fellows might be made very uncomfortable, to say the least. I once had a brown hive which got so hot that it melted the combs, and let the honey run out in front. I painted it over white, and had no farther trouble, although I allowed it to remain in the sun as before. I once was quite a friend to a kind of chemical paint, but, since having a larger experience, and testing pure white lead by the side of other kinds of paint, I have come to the conclusion that the pure lead and linseed oil is much the nicest and most durable, besides being, probably, as cheap, in the long run, as anything else. Instead of putting on a great many coats of paint to commence with, I would paint lightly at first, and then give them another coat, as often as it will improve their looks or durability. Do not go by fits and starts, in fixing up your apiary, but keep fixing all the time, and keep it *nice* all the time. Perhaps the better way to paint and fix up is to lift the combs out, and set them into a hive all rigged and painted, and then, after that one is fixed, carry it to the next, and so on. This plan is very convenient where the hives need a nail or two, which could not well be put in while it contained bees. I do not think fresh paint is especially offensive to bees, nor do I think new swarms are often driven off by the smell of paint, but I should prefer to have the hives dry, before the bees are put in. I have often painted hives containing bees,

without perceiving any bad results, except that the bees sometimes stick fast to the newly painted surface, which is certainly annoying to the poor little fellows, if nothing more.

CONCLUDING REMARKS ABOUT HIVES.

Work carefully, and avoid mistakes and blunders by carefully measuring, trying, and testing every thing, as you go along. Do not get a lot of hives nailed up, and then discover that the frames will not go in them properly, but have a frame right at hand, and, before you drive a nail, put the frame in place and see if it is right. More than this, be sure that your *frame* is just right. Many bad blunders have resulted from picking up a frame *supposed* to be right, but which was found to be a little too large, or too small, in some of its dimensions, after a lot of hives were made to match it. Have a good steel square, and keep it carefully, that it may not get out of true, or get rusty or injured in any way. To test its exactness, lay it on a broad straight edged board, and draw a fine line along the blade of the square, with a keen pointed knife; then reverse it, and see if the knife point runs in the same track. The drawing below will show you how.



HOW TO TEST A SQUARE.

Let A represent the board with the straight edge. Do not say, "This edge is straight enough," until you have made it as exact as you can. Lay the square on as at B, and draw the line, D E, with your knife point; now turn it over as at C, and draw a line in the same place, or so near it, that you can readily see if the two are exactly parallel. You can take your board to the hardware store, and pick out a square that is right, or you can get the one that is nearest right, and then make it right by filing. Another point: you will find squares with the marks on one side not exactly agreeing with those on the opposite side. This is a very bad fault indeed. Our blacksmith and foreman once had quite a dispute on some iron gauge-frames, and, when the matter was investigated, it was found the square given the blacksmith varied a 32d of an inch in the way I have mentioned. Further investigation showed we had but one square on the premises that exactly agreed on both sides. Now, when you go to buy a square, *look out*.

When you get a square that you know you can put "your trust in," go ahead, but work carefully. Say over and over to yourself, when starting out, "suppose I should find after I get these done, that they are all wrong;" and so measure and try your work, at every step. It is just as easy to cut boards in the right place, as it is to cut them in the wrong one; and it is just as easy to have all the different parts of your work nice and accurate, as it is to waste your time by careless bungling, and then trying to patch up the consequences of your own awkwardness. I know, for I have made a great many awkward mistakes in my life, and I also know, by experience, that one so awkward and careless that he, at times, almost feels as if there was no use of trying to be a mechanic, or hardly anything else, for that matter, *can* learn to be careful, and to do nice work. I also know the thrill of pleasure that rewards one, after he has successfully fought these besetting sins, and come out triumphant. Once more, be careful; work slowly, until you know your work is all right; have your tools all nice and sharp; keep everything piled up in neat order; look pleasant, *be* pleasant, and thank God every day for being a great deal kinder to you than you deserve, while you ask him to help you overcome these besetting sins.

MAKING HIVES BY HAND.

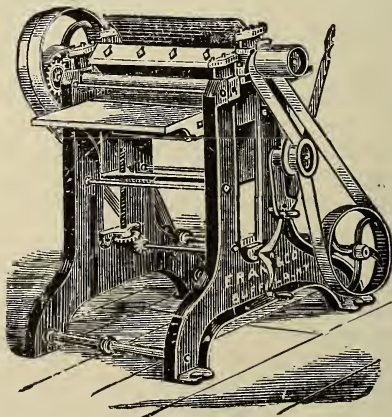
You *can* make your hives of lumber that is not planed at all, but as this is necessarily of all kinds of thicknesses, I can hardly think you, or any one else, could *afford* such hives. If we plane it, it should be planed to an exact thickness; and as this is almost an impossibility by hand, I think we would better take it to a planing mill. Even should you conclude to plane your stuff by hand, these same directions will apply all the same. Our Chaff hives were all planed by hand, in every part, the first year we made them. With a hand saw and square, you can cut up the lumber very well, but if your time is valuable, and you have 25 colonies of bees and a prospect of more, you will most assuredly save money by having some kind of a foot power circular saw. On this account, all the directions for making the Simplicity hive were specially adapted to the foot power saw. To be sure that I was in error no where, I stood over one of the workmen, while he made a complete hive, with the saw we use. If you really desire to have a hive with a hand saw and plane etc., you are to cut your stuff up, just

as I directed. Straighten one edge with a jack plane, in the good old way (beg pardon, if this sounds sarcastic, I tried not to have it); then with a gauge mark out the width of your boards, saw them out with a hand rip saw, and plane down to the line. When this is done, with a plane and bevel square dress off one corner, until you have the desired bevel for the bottom edge of the boards. The rim to go around under the cover can be dressed out in the same way. The shoulder that we made on the top edge, to exclude wind and rain, can be cut very nicely after the hive is nailed up, with a plane bit ground on a grindstone until it will cut the desired shape. Saw the boards off in a large mitre box. You can do it, and you can make nice work, but it will pay you just about as well as it will to mow a 40 acre field with a scythe, when you can get your neighbor's mowing machine for a trifle, to do the whole quickly and nicely.³⁴

SECTION HONEY BOXES.

ALL ABOUT MAKING THEM, AND SOME OTHER MATTERS.

The best material which we can obtain in this locality for honey boxes is nice, white, clear-grained basswood. It should be sawed into planks, about 2½ in. thick, that it may be full 2 in. when seasoned. Such lumber is worth here, at present, \$16.00 per M. After the lumber is seasoned, it is ready to be planed, and, for the sides of the sections, should work full 1½ in. As the tops and bottoms are ¼ less in width than the sides, they may easily be made from ordinary 2 in. stuff. As the cigar box-planer just mentioned is hardly heavy enough to plane these planks, we will use what is called the 18 in. Gem planer, shown in the following cut.



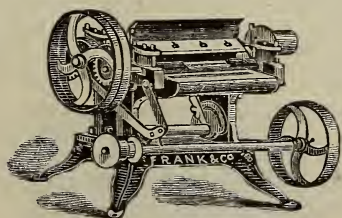
18-INCH GEM PLANER.

These small planers have astonished us by the beauty and accuracy with which they do their work, and the small amount of power with which they may be run. Our machinist said he did not think we could plane a 16 inch board, with a $4\frac{1}{2}$ horse power engine, but with only 40 lbs. of steam, we cut a full $\frac{1}{2}$ inch from the hardest and knottiest board we could find, and the planer did not even slack its motion. As the machine cost us, all belted and ready for work, only \$70.00, we were very agreeably astonished. A 2 horse power engine would run the planer very well, if a light cut at a time was made.

After your planks are all planed, you are to cut them up into pieces convenient to handle. We usually make them from 3 to 4 ft. long. With a heap of these near your buzz-saw table, you are ready to saw them into strips. These strips are sawed of such a thickness that, when planed, they will be just about 5-32 in. thick.

When we used to make our sections of sawed strips without planing some of our friends complained because our sections were grooved a little deeper than the thickness of the stuff; this was done, because, in sawing, we can not get the stuff all exactly of a thickness, and we were therefore obliged to make the dovetailing deep enough, to take in the thickest pieces, otherwise, we should have the thick pieces increasing the outside dimensions of the box, and this might prevent a nice fit inside of the large frames. The only remedy was to have the stuff planed to an exact thickness; and although we often thought of this, we as often decided that they could not be made, nicely planed all over, for one cent each, or less. Finally, our sawyer startled me, by asking why we could not have a little planer, to take long strips right from the buzz saw, and plane them automatically. Sure enough! Why not?

I soon found that there is a little planer made, called a Cigar Box Planer, and ere long, we had one planted just back of the saw. I give you an engraving of it below.



CIGAR BOX PLANER.

This little machine does its work most

beautifully, and requires so little power for the planing of these pine strips, that in the absence of other power, one man with a crank would probably run it without trouble. After we got it well started, our sawyer, who is an intelligent mechanic, exclaimed,

"Why, Mr. Root, I would almost work for nothing, if I could have machinery that would all run as nicely as that little machine does."

The strips, as they come out, are most beautifully smooth, for these small planers, as they come from the factory, are all sharp and in working order, without so much as even furnishing a belt. The best part of it is, the strips are *exactly* of a thickness. For the usual section boxes, they are sawed about 2 inches in width, or a little more, and in length, to suit your pleasure.

We will suppose you have ripped off and planed about 100 of these thin strips; 101 is just the number, to be exact. Shake out the shavings, place the planed surfaces all one way (we do not want the sections planed on their inner sides, because the bees could not so readily attach their combs) and then screw them up in screw clamps like the cut below.



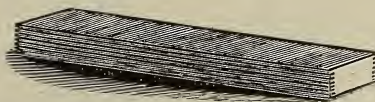
CLAMP FOR MAKING SECTION BOXES.

These clamps are made to compass just 16 inches. Below we give you a drawing of the bundle of strips, with a clamp screwed on them, at about every $4\frac{1}{4}$ inches.



BUNDLE OF STRIPS FOR SECTIONS.

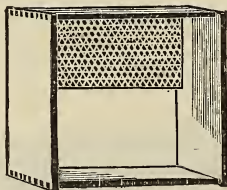
Well, this plank as it were, composed of the 101 strips, is to be placed on the saw table, and sawed into bolts or bundles, $4\frac{1}{4}$ in. long, one of the clamps coming near the center of each. These are now to be run over the gang of grooving saws and they are finished.



BUNDLE OF PIECES FOR SECTION BOXES, AS THEY LEAVE THE SAWS.

These bundles each contain 101 pieces. I would insist on this exact number, to save mistakes that will creep in, if you have any odd number; for the figuring with fraction-

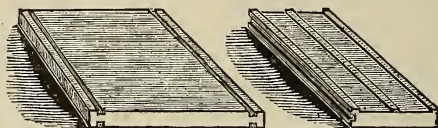
al parts of a hundred necessary to put up an order, may amount to more than the goods are worth, and even then, expensive mistakes will happen. One season, a bee-keeper away in Iowa informed us, just about swarming time, that his box of 1000 sections was lacking either sides or tops, and it cost us several dollars to make the matter straight, express and all. Now if we always have 101 in a bundle—the odd one is to be sure to make good count—and then make our packing boxes so that 20 bundles will just fill them, our shipping clerk cannot well make a wrong count. They are put up ready to ship in boxes of 500 each. But he may give us too many tops, and not enough bottoms? That is true, and it reminds me, that the pieces for the tops are to have a thin saw cut exactly in the center, the whole length before they are screwed up in the bundles. Well now, to fix it so he *can not* make a mistake, we will put in each of the bundles of narrow pieces, 51 grooved, and 50 without the grooves. Then, in packing, he is to get 10 bundles of the wide side pieces, and 10 bundles of the narrow ones, and the packing boxes are to be made so as to hold just these and no more. As to the thickness of the strips, I would set the planer so that 101 pieces just fill the 16 inch frame when screwed up close enough to hold. You can tell this best by trying, and after you get your planer just right, make a mark, so that you can set it in just the same place again. I said the width of the strips should be a little less than 2 inches; we want them so that 7 of them close up side by side, with the 7 tin separators between them, will just make 14 inches. The Simplicity hive is 14½ inches inside, and we shall therefore have the ½ inch to wedge up the frames of sections. When they are to be removed, take out the two wedges and the first frame can be lifted out easily. (See page 116). The tops and bottoms of the sections are ¼ inch less than the sides.



ONE-POUND SECTION BOX COMPLETE.

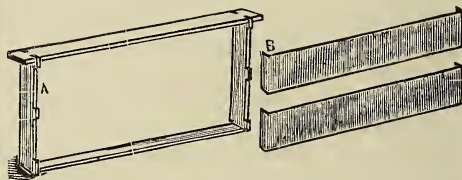
The cases for holding the sections, as well as the broad frames, are made with the same tools, and much in the same way. Instead of 101 in a bolt, we have just 50, so they are twice as thick as the section stuff.

The bottom bar is made exactly like the bottom bar of the sections, grooving and all. The top and sides are the thickness of a sheet of tin wider than the sides of the sections. This makes them come tight against each other, when wedged up in the hive. Below, we show you a bundle of finished top bars, and also one of the side bars.



BUNDLE OF TOP BARS. BUNDLE OF END BARS.

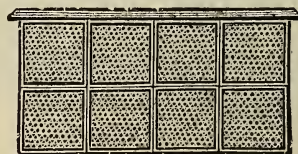
The grooves in the sides of the top bars, and the one in the ends of the side bars, are cut with a Cutter Head, to be described further on. The broad grooves in the side bars, are for the purpose of bringing the tin separators into just the right place, and for letting them in flush with the wood, that the frames may come up tight. Where the tin comes between the frames, and separates them but a trifle, the bees will fill in the crack with propolis. We wish to stop all this so far as we can. The cut of the frame below will give you an idea of the way in which the separators are put on.



BROAD FRAME TO HOLD 8 SECTIONS, AND TIN SEPARATORS.

The tin is so cut, that when a ½ fold is made on each end, it can be just snapped into the notches at A and B. They can be used without tacking, but those we ship, are tacked fast with four slender brads. The tin should be stretched on the frame, to prevent its bulging, and making depressions and elevations in the comb honey.

The shallow notches are very quickly made in the bolt of end bars, with a common rabbet plane. To guide it in the exact spot, and to have it cut the notches of the proper width, a frame of strips of board is placed over the bolt which guides the plane.



FRAME FILLED WITH SECTIONS OF HONEY.

A great many, at first view, ask why we do not use solid plank, and rip off the strips after having done the grooving, etc. The great reason is, that we should be obliged to rip off these little pieces one at a time, and then handle them singly to plane, and tie up. With the plan I have given, we rip and plane 10 or 12 pieces in a strip: when bundled up, we cut off 100 at once. This means, 100 cuts one way, and 10 the other, 110 in all, make 1000 pieces: by the other plan, the workman would have to make 1000 movements. This system of working in wood can be used in making boxes and frames of almost every description, and for a great variety of wood work, where great numbers of pieces are wanted exactly alike and at a very low figure.

Now, about grooving the ends of the pieces, or the dovetailing, as it is frequently called. A year ago, I told you how to saw one or two grooves at a time, by means of a steel track parallel with the saw, on which the first groove runs as soon as it is sawed, as a guide for the rest. This plan does very well, but it is slower, and not as accurate, as when we have a gang of 8 saws to cut the whole number at once. The saws we use are $4\frac{1}{2}$ inches in diameter, and about 3-32 in thickness. They are run by steel washers between them, that gauge the tightness with which the sections fit together. If they are too loose, a washer of thin paper put between them will make them tighter. The saws are sharpened like a rip saw, but they have no set. They get dull very quickly, for cutting constantly in the end of the wood is very severe on saws. A $3\frac{1}{2}$ or 4 inch belt will be required to run these saws, and the pulley should be not less than $3\frac{1}{2}$ inches in diameter. The shaft should be about 1 inch in diameter, and should run in broad strong boxes; it may be $\frac{1}{4}$ in., where the saws go on. As these saws must cut always the same width, exactly, it is best to run them without set; and to make them "clear" in this shape, we have them ground thinnest in the center. Such saws $4\frac{1}{2}$ inches in diameter are worth about \$2.00 each; a steel washer 50c more; and a suitable mandrel and boxes \$10.00. Therefore the whole outfit, with 8 saws, will cost about \$30.00. I confess, I am not very well pleased with any of the grooving arrangements I have ever used. They answer very nicely at first, it is true, but they need so much filing or grinding, that it is quite a task. They all work nicely running with the grain, or across the grain, but cutting into the end of

a block seems to be a different matter.

If we wish grooves and tenons more than $\frac{1}{8}$, say $\frac{3}{16}$, the Barnes Cutter Head is an improvement. These require sharpening frequently, it is true, for they are like a saw with but two teeth; but they clear so nicely, it is really a pleasure to work with them. Perhaps I should say, when they are in proper cutting order, for neither a saw, cutter, nor any thing else is pleasant to work with, unless it is sharpened just as it should be. It is no use to say you cannot sharpen a saw, for you *must* do it, or you are not fit to be a bee-keeper. Perhaps I can help you a little.

PUTTING CIRCULAR SAWS IN ORDER.

We will take the Cutter Head for an illustration, for it embodies nearly all the principles involved.



CUTTER HEAD FOR GROOVING SECTION BOXES.

The point or spur, D, is of course to cut a little ahead of the chisel shaped cutter, C, and is to gauge the exact width of the groove, while C follows after, and takes out a shaving of wood. Now suppose the tool be so carelessly ground that the heel, B, is higher, or rather farther from the hole in the centre than the cutting edge, C; it is very plain that the heel would only rub on the wood, get hot, and make things smoke, without doing any cutting at all. At about this stage, the operator of the foot-power saw is in danger of losing his temper; especially, if he has tired himself out, and worked himself into a perspiration, without stopping to examine into the matter. To illustrate, I will give a letter that Barnes Bro's wrote us, after one of our customers had complained of his Cutter Head.

We mail you this A. M. the cutter-head that Mr. ——— returns by our request, for our examination. He has ground it, or sharpened it, from the outside, and spoiled it of course. It should be ground or sharpened from the inner edge. Please put it on the saw and you will see that the edge is ground down so that the part back will not let it cut; hence the jumping he speaks of. You will also see that it has never been sharpened on the inner edge, the temper color has not been removed. We would as soon tell a man not to hitch to the tongue of a wagon, after selling him one, as tell him not to grind these cutters on the outer edge. You will find, on grinding back and allowing the edge to be the highest, as it was originally, that this same cutter will beat the best saw (especially when gauged), cutter, or groover you can get. We like fair play, especially when things are so plain as to need no explanation. If you have time, we would like you to write him,

and after grinding the cutter properly, return it to him to convince him. W. F. & JOHN BARNES.

Rockford, Ill., Sept. 11th, 1877.

That the above is somewhat harsh, I am aware, but I have given it you to show that I think there is blame on both sides. Our friend was thoughtless, it is true, but had the cutter been sent him, ground just as it should be, at first, he would have succeeded and been pleased; and if it afterward got out of "rig," he would have known the fault was not in the construction of the implement. I have purchased much machinery, and I am sorry to say, but little of it has been in really nice working trim when first received. The planers I have mentioned were a pleasant surprise in that respect, for they were almost as sharp and keen as a razor, and every part was as carefully in order as if the maker had fitted it up for his own use. If all kinds of machinery were sent out in just this shape, it would save ever and *ever* so much trouble and bother, and hard words and feelings all round. I know it costs money to do this, and I know it is hard to find a man who will take pride in having everything just right, no matter what the cost may be; but it should be done. There will be no difficulty in getting a price to cover all expense, after the work has once earned a reputation.

The Cutter Head was received, as it was stated. The blue on the steel showed that no file or stone had ever touched it on the inner edge at A, but our friend had ground the outside, in the manner stated. I took the tool to one of our hands who runs saws, explained the matter, and desired him to fix and try it. As it did not cut very well, I stopped it and looked, and behold, *he* had not even taken the blue from the steel on the inside.

Friend Barnes, I fear there are a great many thick headed people in this world, and I sometimes have reason to think I am "chiefest" among them. Then what shall we do? I guess we shall have to make everything *very plain*, and I guess our tools would all better be sharpened *just right*, before they are sent out, and then purchasers will certainly know how they should be.

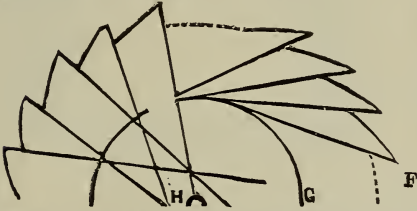
Messrs. Barnes Brothers have just sent us a pair of their improved Cutter Heads. They are of much nicer finish than their old ones, and there has been some grinding done on the points of the knives; but neither of them are ground as they should be to make the best speed in cutting. I think the gentlemen will excuse these criticisms, for I have always found them very ready to adopt

any improvement, or suggestion I may have made, if a good one. We owe them a vote of thanks already, for having made such great reductions on the prices of almost all kinds of foot-power machinery. The spurs on the cutters sent, were too long, and they were of such shape that the block of wood was shaken while being grooved; when they are made so as to be thin sharp blades, cutting about the thickness of a sheet of paper into the wood, in advance of the chisels, with the steel ground back so as not to bump or rub against the sides of the finished groove, your block will stand as steady as if no cutting was being done, and your groove will be beautifully smooth and clean. Best of all, so little power will be required to do the work, that you will hardly know the tool is cutting. I know, for I have just stopped my writing an hour, to be sure I could make them go. As I have said before, we use saws instead of these cutters, because, with the constant work we have for them, they would require sharpening so often. A saw has 50 teeth or more, where these tools have but two, to do the work.

When I have occasion to use the Foot Power Saw, I almost invariably find it needs oiling. I cannot afford to waste *my* strength, in trying to run a saw that does not run free. I found to-day, that some rubbish had been allowed to get under the treadle, so that it did not come clear down. When this was fixed, I found the hickory spring did not bring the treadle clear up. After I had turned the spring over, the treadle came clear up promptly, and I could get up a speed that would make a cutter, saw, or any thing else "hum." It really makes me nervous, to see one who knows what the saw *can* do, try to work by giving the treadle a series of short stamps, as if it were an unruly sewing machine. If you are going to spin a top, you must draw off the cord, with a "full arm movement," and if you are going to do work with the Barnes saw, you must draw off the strap from the fly wheel in the same way; let the treadle come up as far as it will, and then send it clear down to the floor. If you practice doing this, you will very soon, not only have the whole machine under your thumb, but you will have it under your foot, which is still better. You are now all right, if your saw is sharp, and well set.

Remember the extreme points of the teeth are to do the work, and no power can be spared in making the saw rub or squeeze through the lumber. No part of the saw

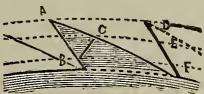
should ever touch the lumber, except these extreme points, and they are to be of such shape, and so disposed, that they pare off just enough to let the saw through, and nothing more. If you stand a chisel straight up on a plank, and draw it across it, it may scratch the wood some, but it will not cut it smoothly. If you try pushing it forward at different angles, you will find there is a certain position in which it will make a smooth cut. This is about the angle we wish to give the teeth of a rip saw. There is a rule for getting this pitch, which you will understand from the diagram below.



SAW IMPROPERLY FILED. PROPERLY FILED.

Let H represent the center of the saw, and F the circumference; G is a line drawn just midway between the center and circumference. Now, if a straight edge is held against the under side of the tooth, it should lie on the line G. Hold your try square on the under side of the tooth of your rip saw, and you can soon see if the teeth are of the right pitch. On the other side you will see some teeth with a wrong angle. Some of them would carry a line toward the center of the saw, and one of them, would go past the center on the other side. You need not say no one ever did as bad work as that, for it is not many years since I complained to Mr. Washburn that my saw would not cut well, and he, with a straight edge showed me just how badly I had been doing. I had commenced in a hurry, and had filed the saw just to make it do a little for the time being; I had filed both top and front of the teeth to get them to a point, "real quick."

Filing a saw on the top of the teeth is a fearful waste of time, files, and especially saws. Perhaps I can give you some faint idea of the matter from the cut below.



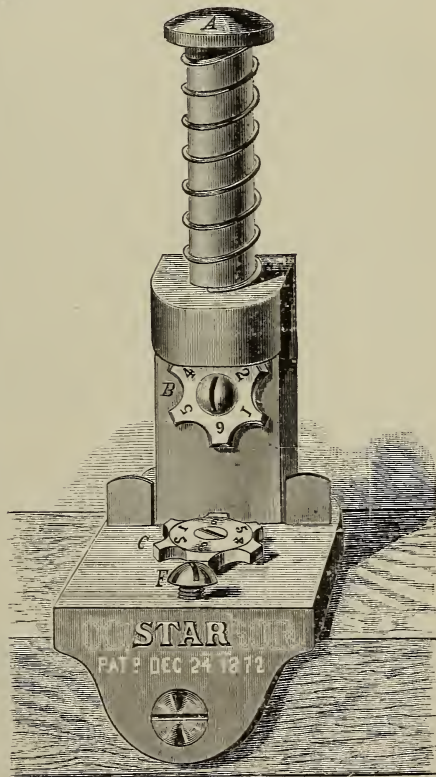
HOW SAWS ARE WASTED, BY IMPROPER FILING.

Let A be the point of the tooth when the saw is new, and C, the point where it would be after having been used for a certain amount of work, the filing having all been done on the under side of the tooth so as to

leave the line A C just as it was when it was made that is, it has been untouched by the file, and has only worn away, in actual cutting on the wood. The saw has been reduced in this way by this amount of work, exactly from D to E. Bear this in mind. Now suppose we have done the sharpening by filing the top of the tooth; in getting the same amount of cutting edge, we should file down from A to B. This would reduce the size of the saw from D to F, instead of from D to E. For filing these small saws from 6 to 10 inches in diameter, we need a file made at just the proper angle like this cut.



The broad side of the file is to be laid on the top of the tooth; it is never to be used for cutting downward, but only to preserve the shape and angles of the top of the tooth, while the cutting is to be done from the under side of each tooth, the top of the tooth being made while sharpening the one just after it.



STAR SAW-SET FOR HAND, BACK, BAND, WEB, WOOD, AND SMALL CIRCULAR SAWS, NOT THICKER THAN 18 GAUGE.

So much for the shape of the tooth; our saw must be set, or it will not clear itself

through the lumber, and for this purpose, we have found the saw set shown, as good as anything for circular saws.

The diagram below will give you an idea of the purpose of setting saws.



THE PHILOSOPHY OF SETTING A SAW.

You will observe that we depend on the little points, A and B, to make a path along the dotted lines, for the blade. If these points get worn off, the saw will pinch, and a great part of the power will be consumed in making it squeeze through the wood. If your saw does not cut easily, this is very likely the trouble. If your lumber is unseasoned or tough, you will need much more set than if you have dry clear tender lumber. Of course we wish to get along with as little set as we can consistently, for the more wood we cut out, the greater is the power required. Now, another consideration comes in. If we do not set the teeth all alike, and it is almost impossible to do this with any saw set, on account of the tendency of some teeth to spring more than others, we shall have occasionally a tooth sticking out more than the rest; this causes much friction, and makes our lumber look bad with grooves ploughed in it at intervals. For large saws, a side file is used, but for our work, I think we can level off the points very well with an oil stone. Lay the stone on your saw table, against the side of the saw, and turn the saw backward by hand. Now be sure you do not trim the points too much, and that you do not hold your stone so as to make the points wedge shaped. When done rightly, your saw should cut smoothly and easily, and the stuff should look almost as if it were planed.

In the drawing, I have given about the right angle for the face of the tooth. The point should be almost square, like the end of a chisel, but as the outside corner has by far the greatest amount of work to do, it should be kept a trifle higher. If you give the point of the tooth a very sharp bevel, the saw will leave a point in the wood like this, at A, and if the saw is crowded, the teeth will spring outward somewhat, as shown in the dark lines, making a great amount of friction, and rough and unsightly work. Have plenty of good files at hand, and touch up the teeth of your saws often, if you wish to accomplish the most, with the least amount of hard work.



The above directions are all for rip saws. A cross cut saw is filed with a 3 cornered file, and needs but few directions different from those already given. As it is always used across the grain, it will work best to have it sharpened so as to leave the point A, as shown in the cut, for this will break off itself. The outer points of the teeth are to be kept very sharp, and are to be leveled up with the oil stone, so they all cut in the same path. The saw must also be set enough to clear itself, in all kinds of lumber. If you wish to cut up boards that are not perfectly seasoned, you will need to set your saw accordingly. You can, with the Barnes saw, cut off a foot board at one clip, if everything is all right. Ours is seldom in order to do this, I know, but if I were going to use it, I would keep it in just such order. The grooving saws for section boxes are to be sharpened like the rip saws. Now I know from past experience, that a great many of you will say you can not invest in all the machinery I have described, but that you would still like to make your own hives, section boxes, &c., having plenty of time in the winter. Well, I think I can do something, for even this class. Wait and see.

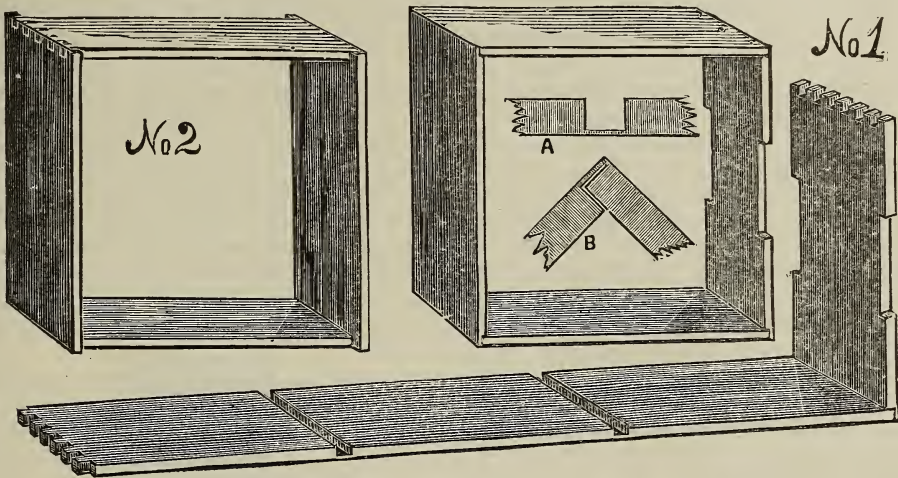
HOME MADE SECTION BOXES.

Some of our friends, among whom is Prof. Cook, have succeeded very well, with section boxes made of the thin veneer used for strawberry boxes. The stuff is simply folded around a square stick of wood, of just the size you wish your section frames. The ends are fastened by tacks, which are quickly clinched, by driving the points against a piece of iron or steel, set in the wooden stick at the proper place. These boxes are of a necessity of the same width all round, and therefore I can hardly see how the bees can get in, unless the frames holding them are hung a little distance apart. If we do this, how shall we use the separators? I am sure I do not know, unless we have our honey bulging outside of the wood; in this case, we could not pack them in a shipping box, nor set the sections up close together; they are also rough and unsightly. The bottom bars might be trimmed narrower with a chisel, or something of that sort, but this would not give a neat accurate job, nor could it be done as cheaply as in the sections I have described.

It is now Feb., 1880, and we have just succeeded in perfecting the machinery for making a modification of the box mentioned

above, which is not only stronger and neater than anything yet devised, but, with the proper appliances, as it seems, is destined to be the easier box to make. The engravings will make it plain, almost without explanation.

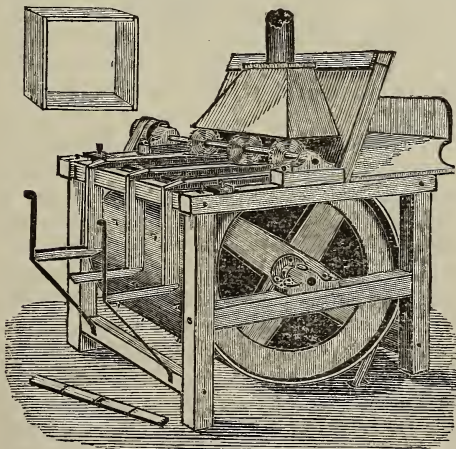
whole number of cuts may be made at one operation. Again; the piece must be pushed toward the saw exactly at right angles with it, or the box will be askew, as it were. To push it accurately, a slide with a cross bar, at right angles, must be used. Now,



GRAY'S NEW SECTION BOX, MADE ALL OF ONE PIECE OF WOOD.

GRAY'S NEW SECTION BOX AND THE MACHINE FOR MAKING IT.

How often do we exclaim, on seeing some new device or implement, "Why, is it possible that no one ever thought of that before?" That was what I thought when Mr. Gray showed me his new joint for sections and other boxes, illustrated on this page. You will at once notice that the principal expense in making this joint is the labor involved in pushing the piece over the saw to make each one of these cross cuts.



MACHINE FOR MAKING THE NEW ALL-IN-ONE-PIECE SECTION BOXES.

I said at once, that we must have a long mandrel, with three saws on it, that the

every time this bar is pushed forward, it must be pulled back ready to take another piece, although the section need not be pulled back at all. Years ago, I thought of an endless belt with strips across it, for feeding stuff up squarely to circular saws, but just now, it occurred to me that a large drum, with pins set in it, might answer the same purpose, and need not be very expensive. My idea was to have the strips lay directly on the drum, as they passed under the saws; but Mr. Gray and Mr. Washburn thought it best to have the drum simply push the strips along, and let them slide on iron tracks, with steel springs to hold them firmly down in place. After they got so far, I told them I wanted it made so it would take a tall pile of the strips, and pick out the bottom one, letting the pile drop down each time, so as to have an automatic machine that would "work for nothing, board itself, and not require any mental or moral discipline;" in short, a machine that would not have to be looked after nights, to see that it was not visiting groceries and learning to swear, smoke, chew, etc., after working hours. Come to think of it, I did not add these latter items when I ordered the machine made, but I will put them in now, so the machine will understand what is expected of it. It is now buzzing away while I write, and by timing the "zip, zip, zip," by the watch, I find it makes just 30 sections a minute,—

handsomer white-basswood sections than I ever saw before in my life.

You observe the long mandrel with its three saws, and the funnel shaped hood just over them. This hood is attached, by a pipe which you see at its top, to our blower, or exhaust fan, which takes all the sawdust right out of the way, that the machine may not get clogged, and that the troublesome dust from the basswood may not render the air in the room unwholesome and disagreeable to the workmen. All of our saw tables and planers are now arranged so as to have the dust and shavings all carried, automatically, right down into a brick room just before the boiler. The large drum that pushes the sticks through the machine explains itself, in the drawing. Right back of the dust hood is the box that holds the pile of sticks, or slats, and the iron arms shown right in front catch the pieces as they come out from under the saws. The saws which we use for cutting the groove are made with two cross-cut teeth and then one rip tooth, and so on clear around. Such saws, made of the right thickness, will cost one-half more than ordinary saws.

To get out stuff for these sections, you want the best, white, clear, basswood. Have the logs sawed into plank 2½ in. thick. After the plank have been stuck up and seasoned, they are to be dressed on both sides, until they are just 15-16 in. We choose this thickness, because 7 frames of them, with the separators on, just fill a Simplicity hive, and leave ½ in. for wedging up. After the plank is dressed, it is cut up into bolts just 16½ in. long. With a cutter head to cut ¾ in., wide cuts are now made in these bolts of plank, at the proper places to make the top and bottom pieces narrower, so as to let the bees pass through. These cuts are about ¾ in. deep. If you want closed top sections, only one cut is made instead of two. The end of each bolt is now dovetailed with the gang of saws, precisely as in the old way, except that one end of the plank is made so as to match with the other end, that the section, when rolled up, may exactly come together. This being done, the bolts are ready to be ripped into strips. The thickness is to be such that, when planed on one side, they are a plump eighth of an inch. They are now ready for the machine as described above.³⁵

HOW TO FOLD THE SECTION UP.

This is a very simple matter when you once know how, but without having it explained, you might bother with it a long while, and then not get a decent section. In

the first place, the machine makes it so that the top and bottom are to come *between* the two sides. Lay the piece flat on the table, with the rough side up; take hold of either one of the sides, or the pieces that are to be sides when they are folded up, press the end hard against the table and, at the same time, raise it so as to make the thin wood bend close up to the end of the stick. Do the same with the other side, and you will have the two dovetailed ends just ready to be driven together with a light mallet. Should you, by carelessness or inexperience, break a joint, it can be nailed with the smallest wire nails, and will look almost as well as if it had not been nailed; but, after you learn how, not one in a hundred need be broken. This corner is a remarkably strong and beautiful one, and it is adapted not only to honey sections, but also to a vast variety of other purposes.

If folded together in glue, it is like the solid wood; and, if you will give me your attention for a little while, I will tell you how to make all kinds of boxes of wood, on a few modifications of this plan.

Suppose, when we are setting the saw to rip off the strips from the bolts of plank, we should put another saw on the same arbor, tight up against the usual one; but suppose this second saw to be so much smaller that it just reaches ½ in. above the table-top when the large saw goes through the plank. This small saw would cut, in the plank, a narrow rabbet, and, when the strip is ripped off, the rabbet is in the strip. Well, when the box is finished and folded up, the rabbet is there still, clear around the inside, and it is exactly what you want for a shoulder for a thin bottom to rest on, if cut just right to drop into it. Drop it in with some glue on the edges, and you have a strong, solid bottom, halved in.

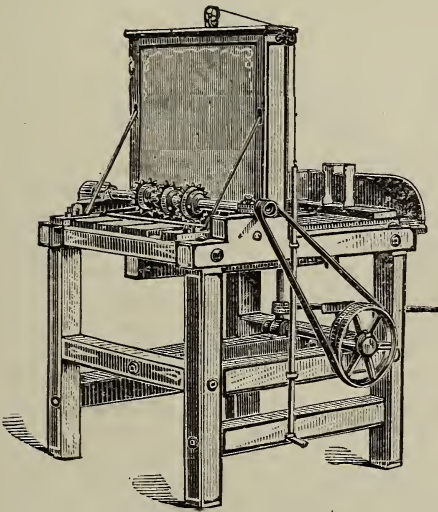
It has taken no extra motions or labor to make this rabbet, for that small saw did it of itself. How shall we manage to get a rabbet to drop the cover in, in the same way, and still have no extra motions to get it? Put a similar saw on the opposite side of the large saw, and turn the bolt end for end, each time you saw a piece off. This comes pretty near it, but it would leave the rabbet for the cover around the *outside* of the box. Now just hold your breath right where you are, and I will tell you what to do. Set the saw on the back side, a little away from the large saw, by a collar, and then you will have a rabbet on the inside, around both top and bottom. In putting the box together,

use glue for the bottom, but none for the cover, only to glue a strip of cloth along one side, to answer as a hinge. Instead of a cover of wood you can use one of glass, and then you can tell what is in the box, without being obliged to open it.

June, 1882.—We have sold over a million of these one-piece sections within the past six months, and at present writing, the demand is beyond the supply.

Aside from boxes for sending goods by mail and express, it seems to me that this machine may profitably be used to make boxes for berries, and small fruits, and make them as cheap or cheaper, and stronger than anything yet in the market.

The machine for making the one-piece sections has been improved, and now appears as presented below.



GRAY'S IMPROVED MACHINE FOR MAKING SECTIONS.

The upper part of the machine, as seen in the cut, is a sort of magazine, as it were, for holding the blanks for making the sections. Instead of the drum shown in the old machine, a sliding table pushes the blanks under the saws, one at a time. The operator has only to keep the magazine full of blanks, and take the finished sections as they come out of the machine, and pack them in boxes holding 500 each. The rod shown in the foreground enables the operator, by means of the foot, to raise the weight that presses the blanks down when replenishing the magazine. The handle at the left of the machine enables him to stop or start the sliding carriage. In practice, it is found that this carriage must be attached to the pitman by means of a *spring*, to avoid

the effects of a shock occasioned by one section getting above another, or crosswise. The spring allows the machine to go on without any thing being broken or injured. The carriage is kept oscillating by a small crank on the upper end of the vertical shaft, kept in motion by an endless screw on the horizontal shaft, working into a toothed wheel, on the vertical shaft.

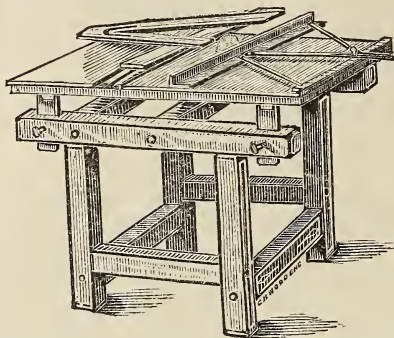
It is now May, 1883, and many things in the bee business have developed far beyond my greatest anticipations. Especially is this the case with hive-making. Simplicity hives are now made and shipped by the carload from many points in the United States, and they are also beginning to be used extensively in many foreign countries. We have sent large shipments to the Sandwich Islands, New Zealand, and other remote points of the world. The chaff hive has also obtained great favor in cold climates, or where difficulty is experienced in w eeing bees. Well, in view of all this I have been led to feel that the directions I have given in regard to making hives with saws run by foot-power are quite inadequate to the wants of the present time.

TABLES FOR CIRCULAR SAWS, DRIVEN BY POWER, FOR HIVE-MAKING.

While a foot-power saw does very well for making, say one hundred or even more hives a year for one's own use in his own apiary, when it comes to making hives for his neighbors, or, perhaps, to ship off to distant customers, almost every one soon finds it too laborious to be pleasant. It is true, he can hire help; but I believe it is generally a pretty hard matter to find help with the necessary enthusiasm to be willing to tread a buzz-saw many hours in the day. The owner of the bees will do it, I know, and thrive on it, for that matter, especially when fighting his way to making a start in the world; but most people during this present age will very soon want to bring in the aid of steam, or something else, to do the work of bone and muscle.

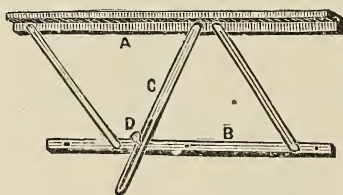
Now, it is almost always suggested by a new hand, that steam or other power be applied to the foot or hand power machine. This can be done, it is true; but as a rule it does not in the end prove satisfactory, for the reason that all foot-power machines are of necessity made just as light and easy running as they can be consistently, and are therefore not calculated for much more strain than the power of a man. If you put on a horse-power or two they will quickly wear

out, or break down. What you want to stand a horse or steam-engine, is something like the cut below.



BUZZ - SAW TABLE FOR HIVE - MAKING BY POWER.

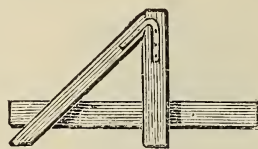
The table is made of 4x4 hard-wood scantling, say maple or ash. The sticks are sized, and the "wind" taken out of them, and then the whole is put together with mortise and tenon, and then drawn up tight with lag screws $\frac{3}{4}$ in. in diameter, by 6 in. long. The table is 48 in. wide, and 42 in. long. It is made of hard-wood boards securely screwed fast to four bars of hard wood about 2x2. A bar is placed at each end, and the other two at equal distances under the middle. The table-top is hung on hinges at the further end as it stands in the cut, and at the end nearest us, in the picture, it rests on hinged strips, resting in mortises, as shown. Set-screws fasten the table at any desired height. Strips of iron should be let into the wood where the points of the set-screws strike, or the wood will soon be injured and mashed up. In the drawing, two gauges are shown. We term these the "figure four" and the "parallel" bar. The former is for cutting off stuff, and the latter for ripping.



"PARALLEL BAR" GAUGE.

This is to be made of the best piece of seasoned maple or cherry you can get. It needs about a 3x4 scantling, one foot longer than the table-top. Rabbet out a piece as shown, to make a bearing for the bars of iron that it swings on. These bars are iron, 1x $\frac{1}{2}$, pivoted at each end with heavy screws. They allow the bar to swing clear up against the saw and back away from it, far enough to cut off the cover of a Simplicity hive,

which is in length 20 $\frac{1}{2}$ inches. To fasten this parallel bar securely at any point, a third iron bar, C, is placed between these two. Instead of being screwed fast to the parallel bar A, it is simply slipped over a steel pin driven into A. There are, in fact, two of these pins, at a distance of perhaps a foot apart. This is to keep the adjusting bar always at pretty nearly a right angle to the parallel bar. Now, this strip of iron has a long slot in it, and a thumb-screw D goes into the slot. By this arrangement it will be noticed that the parallel bar can not swing or move, unless the thumb-screw lets the slotted bar slide under it. By tightening the screw, the parallel bar is a fixture at any point, and it is always parallel to the saw, when once adjusted as described in the A B C book.



THE "FIGURE FOUR" GAUGE.

This hardly needs explanation. That it may slide easily, and without shake, it runs on an iron track. This iron track is simply a straight bar, $\frac{1}{2}$ inch square, screwed fast to each of the strips on the under side of the table-top. It is made of hard-wood stuff about $\frac{3}{4}$ thick. The longest piece, which is grooved to run over the iron bar, is exactly the length of the table. The right-angled piece is two feet long. All are about 4 inches in width. This right-angled piece must be so adjusted as to cut boards off exactly square; and when right, it should be screwed down and braced with iron, as shown, so it can never get racked out of true. On the accuracy and fineness of this adjustment depends all your work. If one could afford it, it would be a fine thing to have the whole table-top, and all of these gauges, of planed iron.

The mandrel used for these saw-tables is our \$7.00 one, generally; but for a great deal of work I would advise the heavier one, costing about \$10.00. A still better one, with united boxes, and self-oiling attachment, is worth about \$14.00.

HOW TO MAKE A CUT-OFF SAW-TABLE.

Where the bee-keeper has but little to do in the way of hive-making he may cut boards on the same table that he uses for ripping. But in order to work this way, he must have somebody to hold the end of the long boards while he cuts them up, or have some

sort of a support on which they will slide over easily.

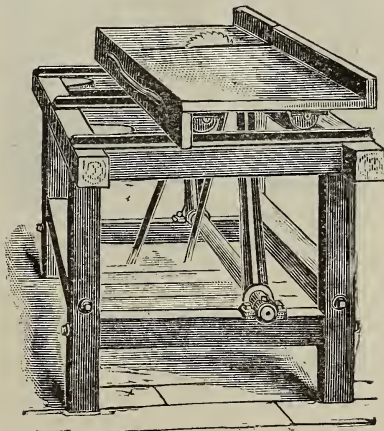
When I used to make all my own hives with a single saw-table, and my saws were run by a windmill, as some of you may remember, I used to have the further end of the board slide on a smooth rest made of a piece of hard wood. With this I could take a 16-foot board, and, without any assistance, cut it up into pieces long enough for hives or covers, and have them so exact that, when piled up, no difference in the length could be told by passing the fingers over the ends. Now, while I could do this day after day, and really enjoy the work, I could not find any one who would do it for me. If I set a couple of boys at it, the one with the other end of the board would move it too fast or too slow, or by jerks, in such a way as to have the pieces, when cut off, of unequal lengths. Then we tried cutting the board up first into pieces long enough for two or three lengths for hives; and then as these pieces were short enough to handle, it was an easy matter to cut them up into exact lengths. This, of course, took a great deal more time; and even then the boards would not be cut squarely across. The reason was, that although the edge of the board might be held closely up against the figure four, unless at least one side of the board was perfectly straight, like a straight-edge, before being cut up, we found trouble after we got through.

There is a way, however, in which a board can be cut up into accurate lengths, even if its sides are not straight. Fix a straight-edge of steel (nice hard wood may do) back of the saw just far enough away to get the length of board wanted. Hold it hard up against your figure 4 and cut off a board once, squarely across. When you have done this, hold the square cut hard up against the steel straight-edge. Now push the board along on the top of the table up against the saw, watching carefully to see that the end is a perfect fit against this steel straight-edge. In this way you can cut up a whole board and have the pieces exactly of the same length. But woe betide you if you are so careless as to leave a crack on either edge, even if it be not more than a hair in thickness. You see, we want the boards so accurate that where there are two stood up together on a smooth surface, neither eye nor finger can detect any difference in the length. In making frames for the hives, this is a most important matter; indeed, I have had nothing in the whole department of hive-making that has

caused me so much trouble as this matter of getting hands who would cut stuff *perfectly accurate*. Many times I could have cried about it (if you will excuse a little exaggeration), had I thought it would do any good.

We are now ready to consider what may be done by the use of machinery, for enabling even unskillful hands, or, perhaps, hands who have never been shown the importance of accuracy in mechanical work, so that they may do work and be exact. When at the Exposition at Cincinnati, last fall, I saw some beautiful iron tables having a pair of saws. These saws could be adjusted at any required distance from each other; and to cut off the board it was pushed against the saws while moving on a carriage of iron. This, you will see, made it next to impossible to have boards cut either too short or too long; but the two cuts every time, made a small waste of lumber.

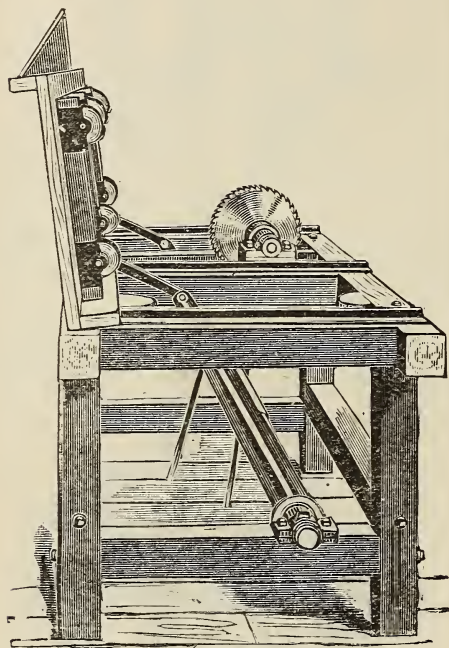
Below we give you some engravings of the cut-off tables we use in our own factory. I don't know whether exactly the same device has ever been used before or not.



A SAW-TABLE FOR CUTTING OFF STUFF.

No. 1 shows the table ready for work, and No. 2 the same with top elevated, which can readily be done to take off saws, etc. It occurs to me just now that our artist has made a mistake, and drawn a rip-saw where he should have shown a cut-off or cross-cut saw, as it is sometimes called. The table is made of 4x4 seasoned maple. On the top are placed three cast-iron V-shaped tracks. The sliding top runs on these tracks on 6 cast-iron wheels having a V-shaped groove in each. This, you will observe, makes the sliding top of the table so that it moves to and fro with great ease, yet without a bit of end shake. At a first glance one would almost think this sufficient; but if you were

to lay a 16-foot plank on this sliding table-top, and take hold of the end, you would find it would have a considerable twist, or "wigggle," on its center. This twist would, of course, prevent cutting off the boards accurately. Now to make the table rigid where it stands, and still bear sliding to and fro, we have what is termed a rocking-shaft.



THE SAME WITH TOP RAISED.

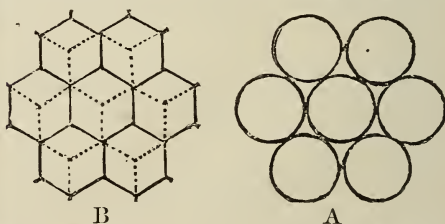
This is a cast-iron shaft about $2\frac{1}{2}$ inches in diameter. Don't make it any smaller, thinking it will do. Better have it larger, if any thing. On this shaft is a pair of rigid cast-iron arms, as you see in the cut. At the top of each of these arms, short iron bars are bolted; and these bars are attached to the movable table-top. Now, providing these bolts all work closely, we have secured our table so that no twist is possible, unless the shaft should twist. But a $2\frac{1}{2}$ iron shaft can not be expected to do this very much. A handle is attached to the sliding top, as you will see in the cut, for drawing it back easily. We have two of these tables in use—one about 10 feet long, and the other about 8, and they are in use almost constantly. Of course, an iron gauge which can be adjusted at any required distance from the saw is a great help for cutting different lengths of lumber. And as before, your stuff *must be held tight up to this gauge*. Such a table, well made, ought to cost perhaps \$45.00 for the short ones, or \$50.00 for the long ones, as described above. If made

as we have directed, it should, with a mandrel of proper size, be capable of carrying a 12 or 14 inch saw, and should cut up heavy planks used for chaff-hive corners, or such as will be required for slicing up wood into separators, or any similar work. Where inch boards are to be cut, or any thing thinner, we pile them up until we get as many as the saw will reach through. By this means we cut three or four, or even more, where the lumber is thin, at one cut, and one person handles it all easily.

I almost forgot to add, that all kinds of buzz-saws are dangerous. Since we have been in the business, four different boys and men have lost a large part of one hand, by letting them slip against a saw while in motion. If you work with buzz-saws, *be careful!*

HONEY COMB. Everybody knows that the cells of the honey comb are 6 sided, and I presume most people know why they are 6 sided. If they were square, the young bee would have a much more uncomfortable cradle, in which to grow up, and it would take a much greater space to accommodate a given number of bees. This last would, of itself, be a fatal objection; for to have the greatest benefit of the accumulated animal heat of the brood, they must be closely packed together. This is not only the case with the unhatched bees, but with the bees of a whole colony in winter; when each bee is snugly ensconced in a cell, they occupy less room than they could by any other arrangement.²⁶

If the cells were round, they could be grouped together much in the same way as they are now; viz., one in the centre, and 6 all around it, equally distant from the central one, and from each other, like the cut, in the figure, A; but even then, the circles will leave much waste room in the corners, that the bees would have to fill with wax.

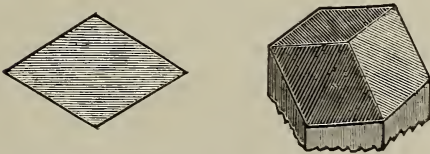


WHY THE CELLS OF THE HONEY COMB ARE MADE 6 SIDED.

At B, we see the cells are nearly as comfortable for the young bee, as a round one would be—of course I mean from our point of view, for it is quite likely that the bees know just what they need a great deal better than we do—and, at the same time

they come together in such a way that no space is left to be filled up at all. The bees, therefore, can make the walls of their cells so thin that they are little more than a silky covering, as it were, that separates each one from its neighbor. It must also be remembered that a bee, when in his cell, is squeezed up, if we may so term it, so as to occupy much less space than he otherwise would; and this is why the combined animal heat of the cluster is so much better economized in winter, when the bees have a small circle of empty cells to cluster in, with sealed stores all around them.

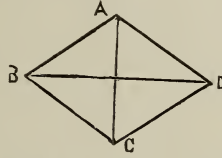
But, my friends, this is not half of the ingenuity displayed about the cell of the bee. These hexagonal cells must have some kind of a wall or partition between the inmates of one series of cells, and those in the cells on the opposite side. If we had a plane partition running across the cells at right angles with the sides, the cells would have flat bottoms which would not fit the rounded body of the bee, besides leaving useless corners, just as there would have been, if the cells had been made round or square. Well, this problem was solved in much the same way, by making the bottom of the cell of three little lozenge shaped plates. In the figure below we give one of these little plates, and also show the manner in which three of them are put together to form the bottom of the cell.



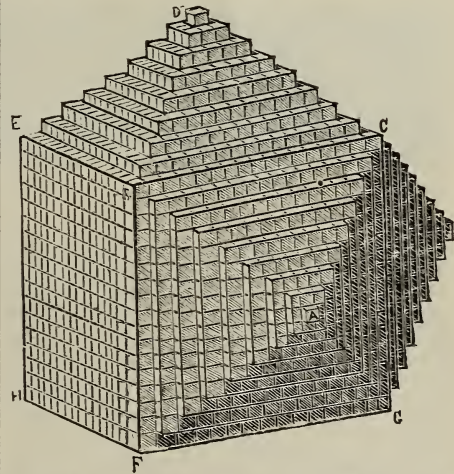
HOW THE BOTTOM OF THE CELL IS MADE.

Now, if the little lozenge plates were square, we should have much the same arrangement, but the bottom would be too sharp pointed, as it were, to use wax with the best economy, or to best accommodate the body of the infantile bee. Should we, on the contrary, make the lozenge a little longer, we should have the bottom of the cell too nearly flat, to use wax with most economy, or for the comfort of the young bee. Either extreme is bad, and there is an exact point, or rather a precise proportion that the width of this lozenge should bear to the length. This proportion has been long ago decided to be such that, if the width of the lozenge is equal to the side of a square, the length should be exactly equal to the diagonal of this same square. This has been

proven, by quite an intricate geometrical problem; but a short time ago, while getting out our machine for making the fdn., I discovered a much shorter way of working this beautiful problem.

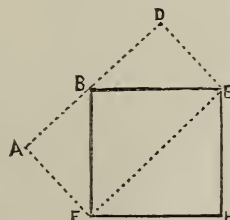


In the figure above, let A B C D represent the lozenge at the bottom of the cell, and A C the width, while B D is the length of said lozenge. Now the point I wish to prove is, that A C bears the same proportion to B D, that the side of a square does to the diagonal of the same square.



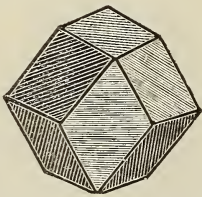
THE MATHEMATICS OF THE HONEY COMB.

Suppose we have a cubical block, E B C G F, and that we pile small blocks on its sides as shown, so as to raise pyramids of such an inclination that a line from any apex to the next, as from A to D, will just touch the edge of the cube, B C. Now A C D B is the geometric lozenge we are seeking. Its width, B C, is equal to one side of the square, E B F H, for it is one side of the cube. Now to prove that A D is equal to the diagonal, E F, we will use the diagram below.



Let E B F H represent the cube, and the

dotted lines, the pyramids. If the pyramids are so made that the line, ΔD , is a straight, continuous one, it is evident, by a little reflection, that the angles, Δ and D , will be right angles. If this is so, ΔD is exactly equal to $E F$, the point we were to prove. Now, referring to the former figure, if we should go on building these pyramids on all sides of the cube, we will have the beautiful geometrical figure called the rhombic dodecahedron; it is so called, because it is a solid figure having 12 equal sides, and each side is a rhomb, or lozenge, such as we have described. Where the obtuse angles of three of these rhombs meet, as at C , we shall have the exact figure of the bottom of a honey comb cell. A picture of the geometrical solid we have mentioned, is given below.



RHOMBIC DODECAHEDRON.

How does it come that the bees have solved so exactly this intricate problem, and know just in what form and shape their precious wax can be used, so as to hold the most honey, with the very least expenditure of labor and material? Some are content with saying that they do it by instinct, and let it drop there; but I believe God has given us something farther to do, than to invent names for things, and then let them drop. By carefully studying the different hives in a large apiary, we see that not all of them build comb precisely alike, and not all colonies are equally skilled in working wax down to this wonderful thinness. Some bees will waste their precious moments—and wax—in making great, awkward lumps of wax; coarse, irregular cells: crooked, uneven comb, etc., with very bad economy either for the production of brood, or for the storing of honey; while others will have all their work so even and true, and so little wax will be wasted, that it is wonderful to contemplate the regularity and system, with which the little fellows have labored. Now, it does not require any great amount of wisdom, to predict that the latter would, in a state of nature, stand a far better chance of wintering than the ones that were wasteful and irregular in their ways of doing things. If this be the case, those queens whose pro-

geny were best laborers, most skillful wax workers, as well as most energetic honey gatherers, would be most sure to perpetuate themselves, while the others would, sooner or later, become extinct. I have found more of a tendency in bees to sport, or to show queer peculiarities, than in any other department of the animal or vegetable kingdom. They vary in color, in shape, in size, in disposition, in energy; and almost every colony, if studied closely, will be found to have some little fashion or way of doing things, different from all the rest in the apiary. Now, when we take into account the fact that many generations can be reared in a single summer, we see how rapidly, by fostering and encouraging any desirable trait or disposition, the bees may be molded to our will. The egg that is laid by a queen to-day may, by proper care, be made to produce a queen laying eggs of the same kind herself, in the short time of only 25 days, as I have explained heretofore. Well, if we should pick out a queen whose progeny made the thinnest comb, and rear others from her, doing the same thing for several generations, we would probably get bees whose combs would break down by the weight of the honey. In a state of nature, this extreme would correct itself, as well as the other; but the point I wish you to see is right here; *geometrical accuracy in the shape of the cells can never be over done, and can only be reached by absolute perfection; and this absolute perfection, the bees have been constantly aiming at through endless ages.* Is it anything strange, my friends, that the bees have got the honey comb pretty near right by this time? I will give you a little story, and one which has been very interesting to me, from page 150, Vol. II, *American Bee Journal*.³⁷

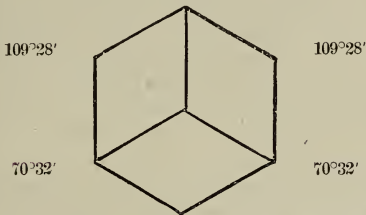
If a single cell be isolated, it will be seen that the sides rise from the outer edges of the three lozenges above mentioned, so that there are of course six sides, the transverse section of which gives a perfect hexagon. Many years ago, Maraldi, being struck with the fact that the lozenge-shaped plates always had the same angles, took the trouble to measure them, and found that in each lozenge the large angles measured $108^{\circ}28'$, and the smaller $70^{\circ}32'$, the two together making 180° , the equivalent of two right angles. He also noted the fact that the apex of the three sided cup was formed by the union of three of the greater angles. The three united lozenges are seen in the figure above.

Some time afterward, Reaumur, thinking that this remarkable uniformity of angle might have some connection with the wonderful economy of space which is observed in the bee-comb, hit upon a very ingenious plan. Without mentioning his reasons for the question, he asked Kœnig, the mathema-

tician, to make the following calculation: Given a hexagonal vessel terminated by three lozenge-shaped plates, what are the angles which would give the greatest amount of space with the least amount of material?

König made his calculations, and found that the angles were $129^{\circ}28'$ and $70^{\circ}32'$, almost precisely agreeing with the measurements of Maraldi. The reader is requested to remember these angles.

Reaumur, on receiving the answer, concluded that the bee had very nearly solved the difficult mathematical problem, the difference between the measurement and the calculation being so small as to be practically negative in the actual construction of so small an object as the bee-cell.

A $70^{\circ}32'$ 

Mathematicians were naturally delighted with the result of the investigation, for it showed how beautifully practical science could be aided by theoretical knowledge; and the construction of the bee-cell became a famous problem in the economy of nature. In comparison with the honey which the cell is intended to contain, the wax is a rare and costly substance, secreted in very small quantities, and requiring much time and a large expenditure of honey for its production. It is therefore essential that the quantity of wax employed in making the comb should be as little, and that of the honey which could be stored in it as great, as possible.

For a long time these statements remained uncontroverted. Anyone with the proper instruments could measure the angles for himself, and the calculations of a mathematician like König would hardly be questioned. However, Maclaurin, the well-known Scotch mathematician, was not satisfied. The two results very nearly tallied with each other, but not quite, and he felt that in a mathematical question precision was a necessity. So he tried the whole question himself, and found Maraldi's measurement correct—namely, $109^{\circ}28'$ and $70^{\circ}32'$.

He then set to work at the problem which was worked out by König, and found that the true theoretical angles were $109^{\circ}28'$ and $70^{\circ}32'$, precisely corresponding with the actual measurement of the bee-cell.

Another question now arose. How did this discrepancy occur? On investigation, it was found that no blame attached to König, but that the error lay in the book of Logarithms which he used. Thus a mistake in a mathematical work was accidentally discovered by measuring the angles of a bee-cell—a mistake sufficiently great to have caused the loss of a ship whose captain happened to use a copy of the same *Logarithmic tables for calculating his longitudes*.

DIFFERENT KINDS OF CELLS IN THE HONEY COMB.

The bees build two distinct, regular sizes; drone, and worker cells. The worker comb measures very nearly five cells to the inch,

on an average. Some specimens average a little larger, and some a little smaller; but when the comb is at all irregular, it is quite apt to be a little larger. The best specimens of true worker comb, generally contain 5 cells within the space of an inch, and therefore this measure has been adopted for the comb foundation.²⁸ If there are five cells to the inch, a square inch would give, on an average, about 25 cells, and 25 on the opposite side would make 50 young bees that would be hatched from every square inch of solid brood. As the artificial comb, or fdn., is so much more regular than the natural comb, we get a great many more bees in a given surface of comb, and here, at least, we can fairly claim to have improved on nature.



DRONE COMB.

WORKER COMB.

The drone comb measures just about 4 cells to the inch, but the bees seem less particular about the size of it, than with the worker. They very often seem to make the cells of such size as to best fill out a given space; and we, accordingly, find them of all sizes, from worker size all the way up to considerably larger than $\frac{1}{4}$ of an inch in width. Drones are raised in these extra large cells without trouble, and honey is also stored in them, but where they are very large, the bees are compelled to turn them up, or the honey would flow out. As the honey is kept in place by capillary attraction, if the cells exceed a certain size, the adhesion of the liquid to the wax walls is insufficient, of itself, to hold the honey in place. Where drones are to be reared in these very large cells, the bees contract the mouth, by a thick rim. As an experiment, I had some plates made for producing small sheets of fdn., having only $3\frac{1}{2}$ cells to the inch. The bees worked on a few of these, with these same thick rims, but they evidently did not like the idea very well, for they tried to make worker cells of some of it, and it proved so much of a complication for their little heads, that they finally abandoned the whole piece of comb, apparently in disgust. Bees sometimes rear worker brood in drone comb, where compelled to from want of room, and they always do it in

the way I have mentioned, by contracting the mouth of the cells, and leaving the young bee a rather large berth in which to grow and develop. Drones are sometimes reared in worker cells, also, but they are so much cramped in growth, that they seldom look like a fully developed insect.

Several times, it has been suggested that we enlarge the race of honey bees, by giving them larger cells; and some circumstances seem to indicate that something may be done in this direction, although I have little hope of any permanent enlargement in size, unless we combine with it, the idea of selecting the largest bees to propagate from, as given a few pages back. By making the cells smaller than ordinarily, we can get small bees with very little trouble; and I have seen a whole nucleus of bees so small, as to be really laughable, just because the comb they were hatched from, was set at an angle, so that one side was concave, and the other convex. The small bees came from the concave side. Their light, active movements, as they sported in front of the hive, made them a pretty and amusing sight for those fond of curiosities. Worker bees reared in drone cells are, if I am correct, sometimes extra large in size, but as to whether we can make them permanently larger by such a course, I am inclined to doubt. The difficulty, at present, seems to be the tendency to rearing a great quantity of useless drones. By having a hive furnished entirely with worker comb, we can so nearly prevent the production of drones, that it is safe enough to call it a complete remedy.

HOW THE BEES BUILD THE COMB.

In this day and age of bees and honey, it would seem that one should be able to tell how the bees build comb, with almost as much ease as they would tell how cows and horses eat grass; but, for all that, we lack records of careful and close experiments, such as Darwin made many years ago. In our house apiary, there are dozens of hives, where the bees are building right up close to the glass, at this very minute; and all one has to do, in order to see how it is done, is to take a chair and sit down before them. But the little fellows, have such a queer, sleight of hand, way of doing the work, that I hardly know how they do accomplish it.

In a little work, published by Prof. Agassiz, about the year 1867, the renowned naturalist speaks as follows about the way in which bees build honey comb:

"The bees stand as close as they can together in

their hive for economy of space, and each one deposits his wax around him, his own form and size being the mould for the cells, the regularity of which, when completed, excites so much wonder and admiration. The mathematical secret of the bee is to be found in his structure, not in his instinct."

Notwithstanding the promptness with which the folly of such a statement was at once shown up in the bee journals, it seems it never came to the eyes of the Prof., or, at least, he never deemed it worthy of notice; for, in 1873, he gave, substantially, the same thing in a lecture at Cambridge, Mass., and it was praised and published in the *Tribune* and other papers, and sent broadcast all over our land. I believe all the bee journals at once protested against giving the people such "twaddle" (if I may be excused for using the term), as science; but, for all that, I think the learned professor never recalled his blunder, or even so much as admitted that he had never seen the inside of a bee-hive at all, but only guessed at it, or repeated what he had been told by some one.

About two years afterward, the great scientist, Tyndall, by some means, got an inkling of the way in which Agassiz had "put his foot in it," and, in the *Popular Science Monthly*, wisely admitted that the bees did not stand in the cells to build their comb, but fixed them in this wise: says he, "The bees place themselves at equal distances apart upon the wax, and sweep and excavate—" etc. Now if Tyndall is teaching us other things in the same way, i. e., delivering lectures on some subject on which he knows nothing, how much can we depend on any thing he says. Oh why could not he and Agassiz, before attempting to explain the matter to the people, take the time to get a hive of real live bees, as did Darwin, and not be obliged to take any thing at second hand? If they *two*, were afraid of stings, any expert honey raiser could afford them the facilities for a safe observation and thus prevent their going into such folly, or falsehood, to call things by their right names, for they pretend to have knowledge where they have none. *Take the money and buy a hive of bees*, all ye that thirst for knowledge, and take it direct from God's own works, instead of receiving it second hand.

For particulars in regard to the North Pole, or as to whether the planet Jupiter is habitable, we may be obliged to listen to those who should know better than we do; but in our own industry no such necessity exists, for a swarm of bees is within the reach of all.

When distinguished persons have visited my apiary, I have almost invariably heard them mention the great discovery of Agassiz, in regard to the way in which bees build their comb, and when I explain that it was a great mistake, they usually think that so great a man as Agassiz, and one who always went to the ants and bees with his own eyes, must have been right, and that I had made a mistake somewhere.

I have occupied all this space, my friends, just to give you an illustration of how little *real work*, some of the great scientists and lecturers are in the habit of doing, and of the importance of proving things for yourself, with your own eyes and hands.

If we examine the bees closely during the season of comb building and honey gathering, we shall find many of them with the wax scales protruding between the rings that form the body, and these scales are either picked from their bodies, or from the bottom of the hive or honey boxes in which they are building. If a bee is obliged to carry one of these wax scales but a short distance, he takes it in his mandibles, and looks as business like with it thus, as a carpenter with a board on his shoulder. If he has to carry it from the bottom of the honey box, he takes it in a way that I cannot explain any better, than to say he slips it under his chin. When thus equipped, you would never know he was encumbered with anything, unless it chanced to slip out, when he will very dextrously tuck it back with one of his fore feet. The little plate of wax is so warm from being kept under his chin, as to be quite soft when he gets back; and as he takes it out, and gives it a pinch against the comb where the building is going on, one would think he might stop a while, and put it into place; but not he; for off he scampers and twists around so many different ways, you might think he was not one of the working kind at all. Another follows after him sooner or later, and gives the wax a pinch, or a little scraping and burnishing with his polished mandibles, then another, and so on, and the sum total of all these manœuvres is that the comb seems almost to grow out of nothing; yet no bee ever makes a cell himself, and no comb building is ever done by any bee while standing in a cell; neither do the bees ever stand in rows and "excavate", or anything of the kind.

The finished comb is the result of the united efforts of the moving, restless mass, and the great mystery is, that anything so wonderful can ever result at all, from such a

mixed up, skipping about, way of working, as they seem to have. When the cells are built out only part way, they are filled with honey or eggs, and the length is increased when they feel disposed, or "get around to it," perhaps. It may be that they find it easier working with the shallow walls about the cells, for they can take care of the brood much easier, and put in the honey easier too, in all probability; and, as a thick rim is left around the upper edge of the cell, they have the material at hand, to lengthen it at any time. This thick rim is also very necessary to give the bees a secure foothold, for the sides of the cells are so thin, they would be very apt to break down with even the light weight of a bee. When honey is coming in rapidly, and the bees are crowded for room to store it, their eagerness is so plainly apparent, as they push the work along, that they fairly seem to quiver with excitement; but, for all that, they skip about from one cell to another in the same way, no one bee working in the same spot to exceed a minute or two, at the very outside. Very frequently, after one has bent a piece of wax a certain way, the next tips it in the opposite direction, and so on until completion; but after all have given it a twist and a pull, it is found in pretty nearly the right spot. As near as I can discover, they moisten the thin ribbons of wax, with some sort of fluid or saliva. As the bee always preserves the thick rib or rim of the comb he is working, the looker-on would suppose he was making the walls of a considerable thickness; but if we drive him away, and break this rim, we will find that his mandibles have come so nearly together, that the wax between them, beyond the rim, is almost as thin as tissue paper. In building natural comb, of course, the bottoms of the cells are thinned in the same way, as the work goes along, before any side walls are made at all; but the manner of thinning the bottoms of the cells in the foundation, or artificial comb, is quite another thing.

HONEY DEW. This, as its name implies, is a dew that falls during the night, and is sweet like honey; or, at least, a great many claim that it falls like dew in the night, and many have been the learned theories embodied in lengthy papers, to endeavor to account for such a very queer way of doing things, on the part of old dame Nature. It may be that sweet dew does fall from the atmosphere without the agency of aphides, or of any other kind of winged insect, but I, for one, am very much averse to accepting

any such theory. Some writers explain it by saying that the leaves of some trees, and possibly the blades of grass, at certain times and seasons when the conditions are all right, distill the sweet matter from their foliage and blades. I like this explanation much better than the former, but, inasmuch as all cases that have come under my observation could be explained by the agency of the aphides (see APHIDES), I am much inclined to give them the credit of the whole of this kind of honey. When the dew is found on the grass, in situations where no trees or bushes are near, which, it is said, is sometimes the case, I would suggest that it is exuded by some sort of an insect that, after feeding on green foliage, etc., takes a flight in swarms like mosquitos, and ejects the sweet fluid in a sort of spray. It may be hard to prove this, but, nevertheless, I think the idea much more tenable than that the honey or saccharine matter evaporates from the flowers, and then falls like dew. Some of the advocates of the latter theory urge that, in boiling the maple sap, a part of the sugar at least is evaporated, for it is plainly discernible by the smell in the air.

My friends, you smell the volatile essential oil that gives the maple sugar its agreeable odor, and not the sugar itself floating in the air. You can smell burnt sugar also, it is true; but the volatile part in either case is not sugar; for no skill of the chemist will enable him to condense it from the invisible vapor into sugar once more. When it is possible to volatilize sugar by heat, and then condense it again, I shall believe in a honey dew distilled from the atmosphere, like the dews of the night. If this were possible we should see our sugar slowly passing away, while exposed to the air, precisely as does the moisture it contains. Experiment shows that sugar may be wet and dried innumerable times, but that, while the water passes off very soon, the full weight of the sugar is invariably left behind.

In support of the exudation theory, I will say that I have many times found a liquid hanging on the leaves of the basswood and some other trees, in the form of a lather, like soapsuds; but, although this had a mucilaginous property, I could discover nothing sweet about it. Should nature change the starch it contained into sugar, a very simple and oft occurring change, we should have honey dew distilling right from the leaves of the trees; and I have been informed that such has been known to be the case—the leaves of the basswood trees of the forests

have been found dripping with honey. This was during the great honey yield in Minnesota, a few years ago.

In support of the theory that it falls from the air or clouds, it is said that, in the old world, there is a substance called manna (I presume in commemoration of the manna of the Bible), which falls from the air during certain seasons of the year, and that it is gathered and used as food. It has been suggested that this manna is the pollen of a certain kind of tree, which, being light, is carried quite a distance by the wind. Pollen consists principally of starch; and a little dampness, such as the dews of night furnish, will frequently convert this starch into sugar in a very few hours. It is possible, that some kinds of honey dew are the results of the decomposition of pollen, which may become scattered over the grass and herbage.

Another source of honey dew has been recently reported. The following letter very graphically describes the species of bark louse that produces it:

I send you some honey dew insects. Last Sunday, I noticed my bees moving over a small poplar (tulip tree), and upon examining it, I found the leaves dripping with honey dew. Did it exude from the leaves? I saw no living insects, and yet the dew fell in a continuous shower. A closer examination showed me the small limbs covered with scale like bunches, piled on each other like oyster shells. One end of the apparent shell or scale is larger and broader than the other, with a slight crease up the middle; about midway up this crease is a small white dot; this dot is a small valve covering a hole through which the honey dew is thrown by the insect. As I stood and watched, I could see the valve open, a few jets of fluid thrown out, and the valve closed again. This would be repeated every moment or two, and as there are untold numbers of these strange things on the tree, you can have some idea of the amount of dew thrown out. For a whole week now, these insects have been making honey dew; how much longer they will continue to do so, I can't tell, but intend to watch them. I send you some of the insects to-day by mail; if it is anything new, let us all have the benefit of it. I can not yet believe the "Exudation Theory" of honey dew, but will wait till I find out more about it.

M. J. WILLARD.

Jonesboro, Ills., May 26th, 1878.

The scaly little fellows (looking, for all the world, like miniature mud turtles) that cover the twig sent, I should scarcely have thought of calling insects, had it not been mentioned. They are truly wonderful, and, at least, demonstrate that honey dew is not the product of any one species of insects.

Prof. Cook gives a very complete history of the insect, with drawings, in the *American Bee Journal* for Sept., 1878. I was at first inclined to think it might be worth

while to propagate these insects in localities where pasturage is very scarce in the fall of the year, but friend Cook assures us that they are very destructive to our beautiful tulip or whitewood trees. He has given it the name of *Lecanium Tulipifera*.

In conclusion, I would ask those who come across this wonderful substance, or find the bees working on it, to make careful experiments and examinations. Do not jump hastily at conclusions, but go clear to the top and bottom of things. Many have declared there were no aphides on the trees at all, and one man who had so decided, afterward concluded to climb the tree, and, in its very topmost branches, he found the leaves all alive with a sort of green insect, which was spraying the air with the dew in a manner that made it look like a veritable shower, as the sunlight illumined the scene. Look carefully, and then write me your discoveries.

April, 1880.—We have now fair evidence that the leaves of plants do at times exude honey. See the following, taken from page 587 of Dec. GLEANINGS for 1880:

HONEY FROM THE LEAVES OF THE CATALPA.

I came very near forgetting to tell you about the catalpa-tree. It belongs to the family of *Bignoniæ*. There are about 6 trees just around me. They are planted for ornament. It was rich in honey this year, both in the blossoms and on the underside of the leaf. At the axles of the main ribs, the leaves are large. The drops would be large enough for two loads, I should judge. And did the bees work on them? I should have been very much pleased could you have stood underneath those trees and heard their merry hum; but you would have had to be up nearly as early as you were on the morning that you found out about the Spider plant. It would have dispelled some people's notions about plants and flowers secreting honey only from the blossoms. It is the last tree to leaf out in the spring.

W. G. SALTFOED.

Poughkeepsie, N. Y., Sept. 28, 1880.

On receipt of the above, I wrote friend S., for a leaf, and here is the reply that came with it:

Please find inclosed a part of the leaf I told you secreted the honey. They are a little touched by frost now. Their right color is a deep green.

W. G. SALTFOED.

Poughkeepsie, N. Y., Oct. 18, 1880.

We have the catalpa-tree in our town, but it has, so far as I know, never produced any honey. The above facts, and a host of others, seem to indicate, pretty conclusively, that almost every plant in the vegetable kingdom may, at times, be in a condition to secrete honey; and, more wonderful still, it may come from the foliage instead of from the blossoms. I have many times seen bees prying around on the underside of leaves of

different kinds, as if they were in search of something, or had at some time found something there that they remembered. The leaves sent show a black spot at the place where the large veins branch out. To be sure that there is no microscopic insects that have contributed to the production of the honey, a careful microscopic examination would be well, and I have given the dried leaf to the boys, but they can not detect the remains of any such agency.

HORSEMINT (*Monarda punctata*).

This plant was first brought to notice several years ago, and at that time the seeds were sold quite extensively as a honey-bearing plant. It was dropped and almost forgotten, until reports of large crops of honey, said to be from this source alone, began to come in. It first attracted attention on the alluvial lowlands bordering on the Mississippi River: afterward, wonderful reports came from it, from different parts of Texas — one man reporting as high as 700 lbs. gathered by a single colony in a single season. The bees that did this wonderful feat were Cyprians, or, at least, crossed with Cyprian blood. The hive in which they stored it was the common Simplicity hive, tiered up four stories high. This great yield of honey was reported during the season of 1882. As the crop seems almost a total failure this present year, 1883, it would



HORSEMINT OF TEXAS.

seem that the yield is a little uncertain, as with a great many other honey-bearing plants. Considerable talk has been made about raising the plants for honey. One drawback is, that the flavor, and especially when first gathered, is peculiar, and a little unpleasant to most people. After standing several months, however, in an open vessel, protected from the flies (with cheese-cloth, for instance), it parts with its rank flavor, and becomes beautiful-tasting honey, and so clear and limpid that print can readily be seen through a glass jar of it, while the honey is so thick that the jar may be turned over without the honey running. As it grows spontaneously in many parts of the South in vast beds, acres in extent, it would seem better at the present time for the bee-keeper to

move to these localities rather than attempt to raise it further north for honey alone.

HYBRIDS. Everybody who has had Italians very long, probably knows what hybrids are, especially, if they have kept bees when the honey crop was suddenly cut short during a drouth in the fall of the year. The term hybrid has been applied to bees that are a cross between the Italians and the common bee. If one buys an Italian queen that is pure, he can at once set about rearing queens if he chooses, and it matters not how many common bees there are around him; if he rears all his queens as I have directed under ARTIFICIAL SWARMING and QUEEN REARING, he may have the full benefit of the Italians so far as honey gathering is concerned, just as well as if there were no other bees within miles of him. This seems a paradox to most beginners, for we have letters almost daily, asking if it will be of any use to purchase Italians, when other bees are kept all around them. If you are keeping bees for the honey they produce, and for nothing else, I do not know but that you are better off, with other bees in the neighborhood. The queens that you rear will be full bloods like their mother, but after meeting the common drones, their worker progeny will of course be half common and half Italian, generally speaking. These are what we call hybrid bees. In looks, they are much like the Italians, only a little darker. Sometimes a queen will produce bees all about alike; that is, they will have one or two of the yellow bands, the first and broadest being about as plain and distinct as in the full bloods. Other queens will produce bees variously striped, from a pure black bee, to the finest three banded Italians. I have had black queens fertilized by Italian drones, and these seem to be hybrids just the same as the others; I have not been able to distinguish any particular difference.

As honey gatherers, these bees that have the blood of the two races are, I believe, taking all things into consideration, fully equal to the full blood Italians. There are times, it is true, when the full bloods seem to be ahead; but I think there are other times and circumstances when the taint of black blood gives an advantage in respect to the amount of honey gathered, that will fully make up the difference; and I would therefore say, if honey is your object and nothing else, you are just as well off to let your queens meet just such drones as they happen to find. Why then do hybrid queens find slow sale, at about one-fourth of the price of pure Ital-

ians? Just because of their excitability and vindictive temper.³⁹

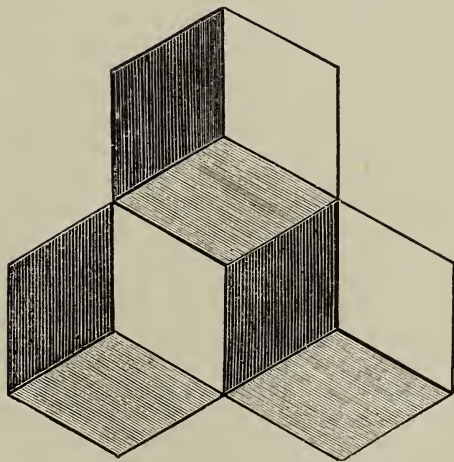
Italians, as they generally run, are disposed to be quiet and still when their hive is opened, and to remain quietly on their combs while they are being handled, showing neither vindictiveness nor alarm. Black or common bees, on the contrary, are disposed to be frightened, and either make a general stampede, or buzz about ones head and eyes in a way quite unlike the Italians. The Italians do not stand still because they are afraid to make an attack, for, let a robber approach, and they will sting him to death in a way so cool as to astonish one who has seen only common bees under similar circumstances. A race of bees so prompt to repel intruders of their own kind, it would seem, would also be prompt to repel interference from man; but such is not the case. They do not seem to be at all suspicious when their hive is opened, and a frame lifted out. Well, these half bloods inherit the boldness of the Italians, and, at the same time, the vindictiveness of the blacks. And to raise the cover to a hive of hybrids without smoke, during a scarcity of honey, would be a bold operation for even a veteran. Without any buzz or note of alarm, one of these sons of war will quietly dart forth and inflict his sting before you hardly know where it comes from; then another, and another, until, almost crazed with pain, you drop the cover, and find that they are bound to stick to you, not only out into the street, but into the house, or wherever you may go, in a way very unlike either pure race of bees. Sometimes, when a hive is opened, they will fix on the leg of one's trousers so quietly that you hardly dream they are there, until you see them stinging with a vehemence that indicates a willingness to throw away a score of lives if they had so many. This bad temper and stinging is not all; if you should desire to introduce a queen or queen cell to these bees, they would be very likely to destroy all you could bring; while a stock of either pure race would accept them without trouble. During extracting time, or taking off surplus honey, you will find little trouble, providing you work while honey is still coming; but woe betide you, if you leave it on the hives until the yield is passed.⁴⁰

In preparing hybrid stocks for wintering, I have seen them so cross that it was almost impossible to get in sight of the hive, after they had once got roused up, and when I charged on them suddenly with smoker in excellent trim, they charged on me as sud-

denly, took possession of the smoker, buzzed down into the tube in their frantic madness, and made me glad to beat a retreat, leaving them in full possession not only of the "field," but the "artillery" as well. This was a very powerful colony, and they had been unusually roused up. Although it was quite cool weather, they hung on the outside of the hive, watching for me, I suppose, until next morning. I then came up behind them with a great volley of smoke, and got them under and kept them so, until I could give them chaff cushions, and put them in proper wintering trim. The queen was extremely prolific, and I do not know that I ever had one single queen that was the mother of a larger

family of bees. Many of these hybrid queens are extraordinarily prolific.

I believe the hybrids are more disposed to rob than the Italians, but not as much so as the common bees. I decide thus, because, when at work among them, the bees that buzz about the hives, trying to grab a load of plunder if a chance offers, are almost invariably full blood blacks.⁴¹ They may have a dash of hybrid blood, but I judge not, because the hybrids and Italians will often be at work, when the blacks are lounging about trying to rob, or doing nothing. I have known a strong hybrid stock to be slowly accumulating stores in the fall, when full bloods, in the same apiary, were losing day by day.



I.

INTRODUCING QUEENS. I do not know, my friends, how I can give any specific directions that will do for all cases, while bees do so differently at times, and different colonies have such different dispositions. I think it is possible to introduce any fertile queen to almost any colony, but it will require a close and careful study of the habits of each, and sometimes much time and patience. Lest beginners should be discouraged at the outset, I would remark that in perhaps the majority of cases the queen can be let loose at once, without any caging whatever. The point is, to determine when this can be done, and when it cannot be done.

The very first thing to be determined is that your old colony is *certainly* queenless. Many will think, if they have found the old queen and removed her, that there can be no doubt about it; but this is far from being true, for a hive quite often contains two queens, and very frequently two laying queens. When the old queen begins to fail, cells are started; and when the young queen begins to lay, before her mother has entirely failed, they are often found laying side by side. If you should remove either one, and let your new queen loose, she would be killed most assuredly. What shall we do in such cases? Well, if the hive has an unusual amount of brood, I would look for another queen, and if not satisfied would wait 24 or 48 hours and see if they had started queen cells; if you see the queen cells started, you may be very sure there is no queen in the hive, although cases are once in a great while found in which they will keep on with the cells when a *virgin* queen is present.

HOW TO FIND AND REMOVE THE OLD QUEEN.

If it is at a season of the year, or during weather when robbers are about or may be expected to be, you had better do your work just about sunset, or so late that all the bees are in their hives. Have smoke in readiness, but do not use it if it can be avoided, remove the cover from the hive very gently,

and do not have any snapping or jarring about your work.⁴²

Draw off the sheet of duck carefully, and then push the frames on each side, away from one of the central brood combs. If you can lift this out without making any disturbance, you will stand a good chance of seeing the queen at once; if you do not find her there, set the frame in your comb basket and examine the next. If the colony is very populous, you may not find her at all, after going over all the combs; in that case look them over carefully as you restore them to their places, and if you do not find her then, close the hive for a short time, and then try again. With Italians, you can often hunt for the queen a couple of hours or more, if you like, but with black bees, if you do not find her the first time, they will usually gather in clusters so much as to make farther search impossible, and therefore you will have to let them get quieted down before you try again. Your eyes will very soon train themselves, as it were, to recognize a queen as soon as you get the slightest glimpse of any part of her body, and during the season of queen rearing, the effort required to spy them out quickly is such that I often dream of seeing queens, and picking them out, all night long, after a busy day in the apiary.*

I rather prefer to pick a queen up by the wings, but if you can get her securely by the shoulders it will do very well; do not get hold of the soft part of her body, or you will be pretty sure to do her injury; if she is a smart active queen, she will be very apt to bite vigorously, and a beginner might be tempted to let her go, doubting the statement so often made that queens never sting when caught. Do not be alarmed, but put her into a cage, and keep her until you are sure your new queen is safe and laying. Never kill a laying queen, until you have one safely laying in her stead.

*If you can not find her by the above plan, shake all the bees on a sheet, or a large white paper, fastened in front of the hive, and then pick her out as they crawl back in. I have never failed by this plan. Two pairs of eyes to watch will be an advantage,

The hive is now presumed to be queenless, but if our new queen is a very valuable one, we will put her in the cage on top of the frames directly over the cluster, until queen cells have been started. This will usually be in 24 hours. Open the hive very gently as before, lift out one or more brood combs, until you find cells enlarged, something like the cup of an acorn, and containing a much larger quantity of the milky food than is ever given a common worker. We can many times recognize where a queen cell is to be started by this extra amount of food, before we can perceive any change in its shape. The hive is certainly queenless, and we are so far safe; if the bees seem good to the queen, we are ready to let her out. When you first turn back the duck, if the bees are clinging in hard knots to the wire cloth, making a kind of a hissing noise as if they would like to tear her in pieces, you certainly must not let her out, and it is rather unsafe to do so, so long as there are a great quantity of bees piled up over the cage. If it is safe to release the queen, the bees should be walking about as usual, displaying no unusual excitement, and the bees on and about the cage should be offering her food in their usual way, and with the deference and respect they usually pay a queen. If they do not do this, keep her caged until they *do* get quiet and respectful. Very often they will receive her thus at once, and it may, in extreme cases, require a week.

HOW TO RELEASE THE QUEEN.

Open the cage close to the cluster, so that the queen, as she crawls out, will have to pass before your eye, so that you can easily rescue her if need be. Have your smoker ready, but do not use it unless compelled to; as she comes out, they will probably come up to see her and get acquainted, and you need not be alarmed if some of them climb up on her back, and walk over her in quite a rude way for receiving visitors, if they only do not begin to try to use their stings. If they do, use a little smoke and cage her again. If they permit her, after a little looking over, to pass on slowly toward the combs, you can let her go down safely; but if convenient, I would give her another "look" after about 20 or 30 minutes. You will find her without trouble, by the eager throng that surrounds her, to make her acquaintance. It may be well to see if she is all right and laying next morning, for I have known them to treat a queen very well at first, and then find her in a ball

of bees half a day afterward. Sometimes this "balling" kills the queen in a short time, and again she may live while thus fettered for 48 hours, or until they get over their frenzy and let her go. I have known queens to have all their wings and some of their legs pulled off in such encounters, and yet do good service for a year or two afterwards. We usually use smoke to make these bees let go of a queen, for if you try to pull them off they are almost sure to sting her. Dropping them into a cup of water will get them off safely, and is often the readiest means at hand.

Many plans have been given to induce the bees to desist when they seem bent on this kind of mischief, such as taking away all their brood, removing all their combs and allowing them only the empty hive, smoking them severely with tobacco, etc.; and although all these remedies answer well at times, I think it just as well to keep the queen caged, providing she has plenty of food in the cage and the bees are not allowed to hatch a new queen in the hive; for if they once get a young queen of their own, it is out of the question to get them to accept any other until she is removed.

The only objection I have heard to this plan of introducing, is that the queen may fly away; and this can be prevented by watching carefully her movements. To sum up, I would say let the bees have the queen just as soon as they will receive her; it may be at once, in 24 or 48 hours, or it may be a week. I have within a few days taken a laying queen from one hive and had her laying in another within two hours afterward. If you have a queen that you do not value, it will be an excellent plan for you to practice, by seeing how many stocks you can introduce her to without caging.⁴³

WHAT TO DO WITH THE ESCORT BEES.

It has been our custom to let these loose with the queen; but, if robbers are about, this is a very dangerous operation. I once released an imported queen, and had her well received, when, noticing the bees remaining in the cage, I shook them in front of the hive. Robbers were about, and when the little fellows attempted to go in peaceably, they were stung to death without mercy. Then, having got into the stinging business, they began to search about for intruders, and, coming across the queen, stung her to death before I could interfere. If robbers are hovering about, put the bees that come with the queen into some other hive. G. P.

Replegle, of Unionville, Ia., first cautioned us in this matter.

Many queens are starved to death, for even if the cages are placed in the midst of sealed honey they almost always take it all away in a very short time. Use the bottle cages I have described, and see that the cage always has both water and candy in it. It has been recommended to daub the queen with honey when releasing her, but this I would strongly object to, because if she is not received, and such is often the case, she will have to be caged again, and as the bees can not lick her off, the honey will, in a short time, kill her. Many highly recommend spraying her and the bees with peppermint, or other like substances, that all may be of one scent, but this is never safe unless she is looked to after awhile, and I am not sure that it does any good at all; many succeed with the plan, but how do they know the result would not have been just the same without the spraying?

WHAT TO DO, IF THE QUEEN FLIES AWAY.

If a queen takes wing and flies away when let out of the cage, leave the hive open and she will be almost sure to come back, in a short time, to just the place where she was let out. A few cases have been reported where they never came back, and on this account it may be well to clip her wings as I have advised. Virgin queens have only been introduced successfully when first hatched. Caging, as we do with laying queens, is almost sure to result in their loss. I do not know that I have ever succeeded with one in that way. See LAMP NURSERY.

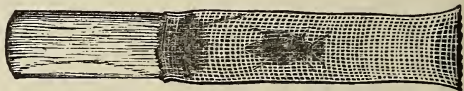
There is one perfectly sure way of introducing a very valuable queen, such as an imported one, if we only observe the conditions carefully. Remove frames of hatching brood from several hives, and shake off every bee; put these in an empty hive, closing it down to a small space, and if the weather is not very warm, place the whole in a warm room; let the queen and her attendants loose in this hive, and the young bees, as they hatch out, will soon make a swarm. As several who have tried this plan have been so careless as to leave the entrance open and let the queen get out, I would warn you, especially, to have your hive so close that no bee can by any possibility get out.* If the frames you have selected contain no unsealed brood, you will have but little loss; but otherwise, the larvæ, having no bees to feed them,

will mostly starve. As soon as a few hundred bees are hatched, the queen will be found with them, and they will soon make a cluster; if the combs have been taken from strong colonies, where the queen is laying hundreds of eggs in a day, in a week or two, the swarm will be a very fair one. Three frames will do very well at first, and one or two more may be added in the course of a week or more. Remember *no live bee* is to be given to the queen. A queen is seldom lost by the first plan given, if you are careful, and watch them until they are safely received. See page 46.

HOW SOON SHOULD AN INTRODUCED QUEEN BEGIN TO LAY?

As a general thing, we may expect her to begin laying next day; but sometimes, especially if the queen has been a long time prevented from laying, as in the case of an imported queen, she may not lay for three or four days, or even a week. If introduced in the fall of the year, she may not commence laying at all until spring, unless the colony is fed regularly every day for a week or more. This will always start a queen that is good for anything.

Caution in introducing queens:—It is quite a common thing to lose queens while introducing them, especially when it is done either early in the spring, or late in the fall. If the weather is cool, it may not be safe to put the cage on top of the frames; unless the colony is very strong and sure to cluster over the cage, it would be better placed between two combs about in the centre of the brood nest, after which be sure to cover all up with plenty of cushions or soft woollens.



INTRODUCING CAGE FOR COLD WEATHER.

It is simply a piece of wire cloth, 3x4 inches, rolled lengthwise, so as to make a tube $\frac{1}{2}$ in. in diameter. An inch of one end of the tube is filled with soft candy, and a 2 dram vial, with the usual notch in the cork, is put in the other end. The queen is put into the cage, and it is then pressed between two combs, in such a way that the bottle is at the upper end. Of course, the cage is put right in the midst of the cluster, where the bees cannot help getting acquainted with her. So far, we have had no failures with it.

ITALIAN BEES. At present, the Italians are by far the most profitable bees we have, and even the hybrids have shown themselves so far ahead of the common bee,

*They can be set out and allowed to fly in two or three days,

that I think we may safely consider all discussions in the matter at an end. Many times, we find colonies of hybrids that go ahead of the pure stock, but as a general thing, taking one season with another, the pure Italians, where they have not been enfeebled by choosing the light colored bees to breed from, are ahead of any admixture. There has been a great tendency with bees, as well as other stock, to pay more attention to looks than to real intrinsic worth; such as honey gathering, prolificness of the queens, hardiness, etc.; and I think this may have had much to do with the severe losses we have sustained in winters past. Since the recent large importations of queens direct from Italy, and a disposition to be satisfied with bees that are not all golden yellow, we have certainly met with much better success in wintering, as well as honey gathering.

Even if it were true that hybrids produce as much honey as pure Italians, each bee-keeper would want at least one queen of absolute and known purity; for, although a first cross might do very well, unless he had this one pure queen to furnish queen cells, he would soon have bees of all possible grades, from the faintest trace of Italian blood, all the way up. The objection to this course is that these blacks, with about one band to show trace of Italian blood, are the wickedest bees to sting, that can well be imagined, being very much more vindictive than either race in its purity; they also have a very disagreeable way of tumbling off the combs in a perfectly demoralized state, whenever the hive is opened, except in the height of the honey season, and of making a general uproar when they are compelled, by smoke, to be "decent." In attempting to introduce some queens to hives of this class, a few days ago, they uncapped nearly all the honey in the hive, and gorged themselves every time I looked them over. The consequence was, that after they had been looked over several times for their queen, queen cells, etc., a large part of their winter stores was uselessly consumed; for the honey they had gorged themselves with started them to building comb at a season when it was not wanted, and so stirred them up, that they were boiling out at the entrance, at a time when "honest bees" should have been snugly tucked away in their winter doze.

Our pure Italian stocks could have been opened, and their queens removed, scarcely disturbing the cluster, and as a general thing, without the use of any smoke at all, by one who is fully conversant with the habits of

bees. Neither will this class of hybrids repel the moth, as do the half bloods, and the pure Italians. For these reasons and several others, I would rear all queens from one of known purity. If we do this, we may have almost if not quite, the full benefit of the Italians as honey gatherers, even though there are black bees all about us.

Suppose you get an imported queen, and rear queens from her eggs, for all your other hives, and all increase you may have during the first season. None of your worker bees, the next season, will be less than half bloods, and all your drones will be full bloods. See DRONE and QUEEN. The queens that are reared now, will, many of them, prove pure, and by persistence in this course, year after year, Italians will soon be the rule instead of the exception. This is no theory, but has been the result practically, in hundreds of apiaries.

Now this is all very clear, plain sailing, but we must take into consideration that our drones are all the time meeting the queens from our neighbors' hives, and from the forests. This will have no other effect the first season, than to produce hybrid workers, without changing the drone progeny, but when these hybrid stocks begin to send out swarms, these swarms will furnish hybrid drones, and soon will come all sorts of mixtures.

Well, we shall have to let them mix, I suppose, and I do not know that it does any particular harm, for any admixture of Italian blood improves the common stock.

But if we are going to buy or sell bees, we want to know what to charge for them, and also what to sell them for; we also wish to know which queens to remove, when we are Italianizing our apiary throughout; hence it becomes very important to know which are Italians and which are not. To be candid, I do not believe it is possible *always*, to tell; but I think we can come near enough for all "practical purposes," as they say in making astronomical computations.

The queens, and drones from queens obtained direct from Italy, vary greatly in their markings, but the worker bee has one peculiarity that I have never found wanting; that is the three yellow bands we have all heard so much about. Unfortunately, there has been a great amount of controversy about these yellow bands and to help restore harmony, I have been to some expense for engravings. As is often the case, I failed to get our city friends to understand just what I wanted the engraving for, so we have made

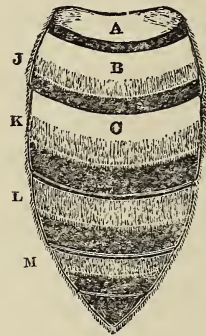
a sketch of the body of the bee ourselves, as shown on this page.

Every worker bee, whether common or Italian, has a body composed of six scales or segments, one sliding into the other telescopic fashion. When the bee is full of honey, these segments slide out, and the body is elongated considerably beyond the tips of the wings, which are ordinarily about the length of the body. Sometimes we see bees swollen with dysentery, so much that the rings are spread to their fullest extent,

dense masses of bees has something to do with it; for we often see such shiny black bees in great numbers, in stocks that have been nearly suffocated by being confined to their hives, in shipping, or at other times.

These bands of down differ in shades of color, many times, and this is the case with the common bee, as well as with the Italian.

Under the microscope, the bands are simply fine soft hair, or fur, and it is this principally, which gives the light colored Italians their handsome appearance. You have,



HOW TO TELL HYBRIDS FROM PURE ITALIANS.

and in that condition they sometimes would be called queens, by an inexperienced person.

On the contrary, in the fall of the year when the bee is preparing for his winter nap, his body is so drawn up that he scarcely seems like the same insect. The engraving on the right, shows the body of the bee detached from the shoulders, that we may get a full view of the bands or markings that distinguish the Italians from the common bees. Now I wish you to observe particularly, that all honey bees, common as well as Italian, have four bands of bright colored down, J, K, L, M, one on each of the four middle rings of the body, but none on the first, and none on the last. These bands of down are very bright on young bees, but may be so worn off as to be almost or entirely wanting, on an old bee, especially on those that have been in the habit of robbing very much. This is the explanation of the glossy blackness of robbers often seen dodging about the hives. Perhaps squeezing through small crevices has thus worn off the down, or it may be that pushing through

perhaps, all noticed the progeny of some particular queen when they first came out to play, and pronounced them the handsomest bees you ever saw; but a few months after, they would be no better looking than the rest of your bees. This is simply because they had worn off their handsome plumage, in the "stern realities" of hard work in the fields. Occasionally, you will find a queen whose bees have bands nearly white instead of yellow, and this is what has led to the so called Albino bees. When the plumage is gone, they are just like other Italians. Now, these bands of down have nothing to do with the yellow bands that are characteristic of the Italians; for, after this has worn off, the yellow bands are much plainer than before. A, B, C, are the yellow bands, of which we have heard so much, and they are neither down, plumage, nor anything of that sort, as you will see by taking a careful look at an Italian on the window. The scale or horny substance of which the body is composed, is yellow, and almost transparent, not black and opaque, as are

the rings of the common bee, or the lower rings of the same insect.

The first yellow band A, is right down next the waist; now look carefully. It is very plain, when you once know what to look for, and no child need ever be mistaken about it.

At the lower edge, is the first black band; this, often, is only a thin sharp streak of black.

The second, B, is the plainest of all the yellow bands, and can usually be seen in the very poorest hybrids. The first band of down is seen where the black and yellow join, but it is so faint, you will hardly notice it in some specimens.

We have at the lower edge of the scale, as before, a narrow line of black; when the down wears off, this shows nearly as broad as the yellow band.

Now we come on to disputed ground; for the third band, C, is the one about which there is so much controversy. Some contend that a pure Italian should show it whether he is filled with honey or not; others, among whom was our friend Quinby, admit that a part of the bees would show it only when filled with honey. Now there are, without doubt, hives of bees that show this third band at all times, but it is pretty certain, that the greater part of the bees of Italy do not. The conclusion, then, is that the bees of Italy are not pure. Now I think we should be careful about going to extremes in these matters, for it is honey, and not yellow bands, that is the vital point. The bees from Italy are better honey gatherers, etc., than ours are, and if we import from Italy, I think we should be satisfied to get such as they have, especially so far as the markings are concerned.⁴⁴ My advice is just this; if you are undecided in regard to a queen, get some of the bees that you are sure were hatched in her hive, and feed them all the honey they can take; now put them on a window, and if the band, C, is not plainly visible, call them *hybrids*. I advise you to put them on the window, because you may mistake the band of down which is often very plain and yellow, for the permanent yellow band, C. Now, the bees from Italy are not all alike, and the yellow bands have different shadings, as well as the bands of down; but they are always found there, so far as my experience goes, if examined with sufficient care.

We have heard about bees having a fourth yellow band; this would have to come on L G; but, although we have made a great many examinations, we have never been able to find more than very bright yellow down, and

no trace of the yellow in the horny scale, as we find it in A, B, and C.⁴⁵

When we come to hybrids, we shall find a greater diversity, for while the bees from one queen are all pretty uniformly marked with two bands, another's will be of all sorts; some beautifully marked Italians, some pure black, others one or two banded. Some will sting with great venom, while others with only one or two bands, will be as peaceable as your best Italians. Without a doubt, many queens have been sent out as pure, that produced only hybrids; but since my recent studies in the matter, I am pretty well satisfied that I have sold several queens as hybrids, that were really full bloods. A very slight admixture of black blood, will cause the band, C, to disappear on some of the bees, but we should be very careful in such matters to be sure that the bees in question were really hatched in the hive; for bees of adjoining hives often mix to a considerable extent. If you examine a colony of blacks and one of hybrids that stand side by side, you will find many Italians among the blacks, and many blacks among the Italians. Take young bees that you are sure have hatched in the hive, and you will be pretty safe, but you cannot readily distinguish the third band, until they are several days old.

HOLY-LAND AND CYPRIAN BEES.

June, 1882. During the past two years there has been quite a little excitement over two new races of bees brought over from the Old World by our most enterprising and philanthropic friend D. A. Jones, of Beeton, Ontario, Canada. They are called Cyprian and Holy-Land bees, from the locality where he found them. The former, from the Isle of Cyprus, seem to have been for many years isolated, and are a very distinct and uniform race. I at first glance called them very nice Italians; and after seeing them the third season, I am strongly tempted to call them very nice Italians still. They have a few distinctive marks that enable an expert to distinguish them, however, and their traits of temper are also different. I believe they have been mostly objected to on account of the vindictive temper displayed by the progeny of some of the queens. We had handled them in our apiary several months before I discovered any difference; but on opening the hive one day toward dusk, and being a little careless in handling the frames, I found I had a job on my hands (or, rather, in my face and hair)—a lot of enraged bees that even smoke did not bring into subjec-

tion. The Holy-Lands seem quiet enough, and the queens are enormously prolific; but for some reason or other, at the present writing quite a number of the friends are getting rid of them, and going back to the Italians again. A strong colony of them in our apiary gathered enough natural stores to winter safely, when none of the Italians did. They, too, closely resemble the Italians, but are, if any thing, perhaps a trifle smaller.

Jan. 1, 1883.—Since the above was written we have had a multitude of reports in regard to these new races of bees, and, I am glad to say, of a much more favorable nature. While the Cyprians are still voted vicious, the progeny of a cross with Italians are found to be very quiet, while they are so industrious that they have given the greatest yields of honey from the progeny of a single queen ever reported from any race. One colony, owned in Dresden, Texas, has given over 600 lbs. of honey, chiefly from the horsemint, or *Monarda punctata*. The cross between the Holy-Lands and Italians also bids fair to be a wonderful help to us, especially in the matter of queen-rearing. The queens are exceedingly prolific, generally filling one frame complete with eggs before beginning on another, giving, when sealed, a solid mass of brood. If in any case a Holy-Land colony becomes queenless they will build a number of cells, exceeding by far that of any other known race. The queens that hatch from these are as strong and robust; in fact, they often fly immediately on emerging from the cells. One of their peculiar characteristics is, that the cells all hatch at or about the same time. During the past summer we have had 25 queens hatch within 30 minutes from one frame. Other cases of like nature have been reported. Now, the fact that the Holy-Lands will raise such an abundance of cells is of great value to queen-breeders. For instance, if we desire a great quantity from some choice stock, we can exchange their unsealed larvæ for that of a queenless Holy-Land colony. The stock, if left to itself, would probably not raise over six or eight cells; whereas the Holy-Lands would very likely raise five or possibly ten times that number. Thus we greatly reduce the number of cell-raising colonies required, at the same giving the others an opportunity to perform. In fact, we can use them much as poultry-breeders use a few select sitting hens for raising the young chicks from non-sitters.

While these new races of bees so closely resemble Italians that very few would, in

looking at them simply, note a difference, they differ widely in habits; and by becoming accustomed to and familiar with these different habits, most of us have found we can handle them just about as well as we do the Italians. One of the first things to be noticed is a sort of fidgetty nervousness when the hive is first opened. If you hold up a frame of Italians, and even give it a gentle shake or jar, not a bee moves; but they often cling so closely it is hard to get them off. Not so the new bees, for they are off in a twinkling, and this feature makes it much easier in extracting, or shaking bees from the frames and cages, to be sold by the pound. The common bees and Italians are readily subdued by smoke; but these, when fully aroused, seem to be made more furious by smoke, unless it is given in such a very large quantity as to almost suffocate them.

Italians and blacks seldom show laying workers until the hive has been at least several days queenless, and without brood; but these bees will often have a score of workers laying almost as soon as their queen is taken away. The wonderful energy of the new races makes it next to impossible for them to be robbed; and the Cyprians especially seem to be so impatient if a robber bee so much as buzzes in front of their hives, that they will often dart out and take him on the wing, when a foot or more from the hive. This unexpected reception so disconcerts the would-be pilferers that they very soon go off somewhere else. This same trait makes it also difficult to unite colonies in the fall, with a Cyprian stock, and we found it next to impossible to give bees, by any method we could devise, to the bees from our imported Cyprian. After they are crossed with the Italians this trait mostly disappears, however. When the new races get started to robbing, they are robbers in earnest; but, unlike the Italians or blacks, they very soon get over it and go to work, when there is no further opportunity to make any thing at it. They are not inclined to buzz before one's eyes for hours together in that tantalizing and provoking way our old-fashioned hybrids often do. If they have any stinging to do they do it, and then go about something else.

The Holy-Land bees, when young or first hatched, have a downy appearance that entitles them to the name of "albinos" much more, in my opinion, than any of our light-colored Italians. This, however, is shown much more in the progeny of some queens than others. In size they are, when not

filled with honey, rather smaller than the Italians, but their bodies seem to elongate, when filled with honey, rather more than the Italians do. When crossed with the Italians the bees seem rather larger than either race pure. Holy-Land queens have usually a ringed appearance that distinguishes them, or even an admixture, from the Italians. The queens, also, have a way of "striding" over the combs, peculiar to themselves. A friend expresses it well by saying they walk about among the bees like a turkey among a lot of hens.

As for wintering, there is not much difference between the two races and the ordinary Italians; and whatever is true of the one race is true in a greater or less degree of the other.

ITALIANIZING. Few questions are asked oftener than, "How shall I Italianize? and when shall I do it?" There is always a loss in removing a queen and substituting another, even where we have laying queens on hand; and where we are to use the same colony for rearing a queen, there is a still greater loss. Under the head of **ARTIFICIAL SWARMING** and **QUEEN REARING**, these points are fully discussed. Where one has an apiary of black bees, his cheapest way, especially if he has plenty of time to devote to the subject, is to purchase a choice tested queen, and rear his own queens from her. If he has as many as a dozen colonies, and proposes to continue to increase the number, it may be his best and surest way, to purchase an imported queen. If the choice queen is purchased in the spring or summer months, I would not remove the old queens, until the summer crop of honey is over; but, instead of allowing natural swarming, take two or three frames from each old stock about swarming time, and make nuclei, giving them queen cells from the Italian brood. When these queens are hatched and laying, build the nuclei up, with frames of brood given one at a time, until they are full stocks. By such a course, you have the full benefit of your old queens during the honey season, until the new ones are ready to take their place. After the honey yield has begun to cease, you can remove the old queens, and give the now small colonies queen cells, as you did the nuclei at first. This does the swarming for the season, and the Italianizing, at one and the same time.

If you have more money than time to spare, and wish to have the work done up quickly, purchase as many queens as you have colonies, and introduce them at any season of the year, as directed in **INTRODUCING QUEENS**. You can purchase all tested queens if you wish, but I would advise taking the dollar queens, while there is any great difference in price.

After your stocks have all been provided with Italian queens, by either of the plans given above, if you wish your bees to be pure Italians, you are to commence replacing all queens that prove to be hybrids, as soon as the young bees are hatched in sufficient numbers to enable you to decide. See **ITALIAN BEES**. Now, if honey only is your object, I would not replace these hybrids, until they are one or two years old; for they will average nearly as well as honey gatherers, and will raise just as pure drones, as full blood Italians. If you should find the bees of any particular queen too cross to be endurable, replace her with another, at any time. Be careful, however, that these hybrid colonies are not allowed to swarm naturally, for, if they raise a queen, she will produce hybrid drones; and this is something we wish scrupulously to guard against. It will be better to raise all the queens yourself, and practice artificial swarming exclusively, while you are seeking to Italianize, especially, if you are surrounded with common bees. If you practice in the manner given above, you can reap the full benefit of the Italian blood, even though there are hundreds of stocks of the common bees, within the range of your apiary. But, if you are going to raise queens for the market, you should buy up or Italianize all the common bees within two or three miles of you, in every direction. The more faithfully you do this, the better satisfaction will you give your customers. Your neighbors will very soon be converted to the Italians, if you keep right along and let crops of honey, rather than talk, decide the matter, and then they will be quite willing to pay you for introducing Italian queens into their colonies. Be sure you do not quarrel, and foster any bad spirit in the matter, but let them have their own way, even if it, at times, is aggravating; and, in a very few years, you will succeed in having your whole neighborhood Italianized.

K.

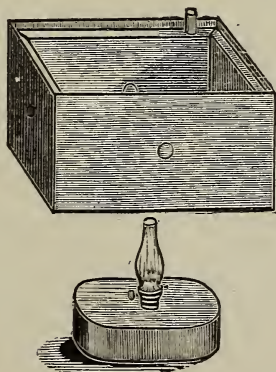
KING BIRDS. Quite a number of the feathered tribes have a fashion of eating bees; even our common fowls sometimes get into the habit of gobbling them with as little fear of consequences, as if they were the most harmless insect in the world. It is quite likely that birds have a way of crushing their prey with their bills so as to prevent the possibility of the bee's using its sting. It has been suggested that the birds and fowls eat only the drones; but several examinations of their crops showed that it is, without question, the workers, and it is quite probable that the honey contained in the honey sack is the principal inducement.

Mr. T. L. Waite, of Berea, O., furnishes some very positive evidence, and also mentions a habit of the King bird, I think is not generally known to naturalists. During the month of June, '72, a flock of seven of these birds were making such regular and constant visits to his apiary that his suspicions were aroused, and concealing himself, with watch in hand, he observed a single bird snap up 5 to 8 per minute. After having

pursued this "innocent" amusement for a sufficient interval, his birdship was in the habit of taking a rest on a neighboring tree, where, after a short meditation, he commenced a series of muscular contortions of the head and neck, that finally resulted in his opening his mouth wide, and "heaving up" a wad of some strange black-looking substance. By chance their perch was close over a bed of rhubarb or pie plant, and our friend secured a number of these wads as they fell, and thus settled the point of their being nothing more nor less than crushed bees. After they had "squeezed" out all the honey, probably having no further use for the "pomace," it was unceremoniously cast aside, while his worship, with a keen appetite and zest for the sport, went "bee hunting" again. They came regularly for a "meal" two or three times a day. I guess we had better use our rifles and shot guns in such a way as to induce them to learn that apiaries are "unhealthy" localities for such boarders.

L.

LAMP NURSERY. Many have observed that, in hot weather, if queen cells are taken out just before they are ready to hatch, the queens will sometimes gnaw out just as well as if they were with the bees. It is also known, that queens just emerging from the cell may generally be allowed to crawl among the bees of any hive, and will, as a rule, be well received. Taking advantage of these two facts, our neighbor, Mr. F. R. Shaw, of Chatham, Medina Co., O., in the fall of 1873, constructed the first lamp nursery. This first machine worked well enough to demonstrate the feasibility of the plan, but, as he depended entirely on hot air to keep up the requisite temperature, it was quite liable to destroy the cells by the unevenness of the temperature. The day after I visited him, I noticed that the copper reservoir on our Stewart stove was sufficiently warm to hatch queens, although no fire had been in the stove for more than 15 hours, and the last night had been cool. This gave me the idea of using a considerable body of water; and before night, I had a hive made with double walls of tin, as shown in the cut below.



LAMP NURSERY.

The space between the two walls is, perhaps, one inch, and extends under the bottom, as well as around the sides, that the body of water may entirely surround the

contents of the nursery, except on the top. The top is to be covered with a quilt, or a warm blanket. The whole should be used in a room well protected from the changes of the weather. It may be kept in a large box, but it is not near as convenient as a room. As accidents sometimes happen to lamps, I would set the lamp in a tall stove, one of the kind that will admit of the top's being taken off, and set the nursery over it. The top of the lamp chimney should be about a foot below the nursery. A second-hand stove, such as was mentioned for making CANDY FOR BEES, will answer every purpose. Such a body of water between two sheets of tin, will cause them to bulge badly unless we put a brace across from one to the other in the center on each side; the position of these braces is shown by the tin cap that covers them in the cut. Light your lamp, turn on a strong blaze, and watch until the thermometer, which should be kept inside the nursery, shows between 80° and 100° , then turn down the wick, until the temperature remains about there. If it gets much above 100° , the cells may be injured; and it should not be allowed to fall much below 80° . We are now ready for our queen cells.

HOW TO GET CELLS FOR THE NURSERY.

You can cut out queen cells, from any place in the apiary, and lay them in the nursery, but as we wish to avoid cutting such unsightly looking holes in our combs, it is better to take the whole frame, cells and all. Shake and brush off every bee, and hang the frame in the nursery just as you would in the hive. Get frames from different hives, until you have the nursery full, if you like. The reason we have the nursery so large, is that it may contain a great number of frames having queen cells. Now you find a trouble right here; the worker bees will hatch and bite out in this warm temperature just as well as the queens; and very soon we shall have a smart hive of bees, and be no better off, than in an out door hive. You

can take out these young bees as fast as they hatch and give them to some colony that needs them, or start nuclei with them, but this is so much trouble, I would advise a better way.

HOW TO AVOID HAVING ANY WORKER BEES IN THE NURSERY.

You will recollect that a worker bee cannot hatch out in less than 20 or 21 days from the egg, while the queen hatches in about 16. Well, if we get all of our cells, by giving a frame of very young larvæ to the colony building them, the queens will be all out of the comb several days before a worker can hatch. This is the way we do it. Get a clean, new, worker comb, or better still, a sheet of fdn., and place it in the centre of the hive where your best queen is. Let it remain until the first eggs laid in it have hatched into minute larvæ, as explained in ARTIFICIAL SWARMING. Hang this frame in any queenless colony, having no other unsealed brood, and they will at once build queen cells upon it. If you will cut two oblong slots in the comb, many think you will thus secure a greater number of cells; but, as this disfigures and mutilates the combs, I have not followed the plan much, since using the nursery. The frame can be taken out of the hive, and placed in the nursery, as soon as the queen cells are capped over; but, as much of the unsealed worker larvæ would not be capped over by this time, I would prefer to wait until 8 or 9 days after the frame was first given them. All worker brood will then be capped over, so that none of it will starve and die, and the queen cells will be so far advanced that but little danger need be feared from shaking the bees off, or from handling them. After taking their cells away, you can give them a second lot of small larvæ to start cells from, or you can give them a young queen from the nursery, as is most convenient. If you can so manage as to give them a queen after rearing a lot of queen cells, and thus alternating, you will probably have less trouble in introducing. If you keep adding fresh combs or cells to your nursery every day, you will soon have queens hatching almost hourly, and sometimes three or four will come out of their cells almost simultaneously.⁴⁶ By holding the comb of cells up to your ear, you can easily hear the queen biting her way through the capping with her strong mandibles. If the cells are built on new combs, or fdn., you can see the motions of the queen, by holding the comb up to the sun or a strong lamp light, and these motions com-

mence from 10 to 24 hours before the queen is ready to come forth. Taking advantage of these facts, we will remove, in the evening, all queens that seem likely to hatch before morning. Where the cells are built on new sheets of fdn., the queen, cell and all, can be picked off the sheet, without even so much as making a hole through the comb, and I have found this an excellent way of introducing, to take the queen in the cell, as soon as she begins to move about, and place it in the hive or nucleus where wanted. Queens that are found hatched and crawling around in the nursery, in the morning, should be taken, at once, to the queenless hives or nuclei waiting for them. Be sure that the hive is queenless, and then just set them down in front of the entrance, and let them crawl in; I have found this plan as good as to open the hive. It seems almost ridiculous, to think we can carry these virgin queens around and let them run into the hives, and find them laying a week afterward, without any farther trouble, but it is something we have done a great many times. To introduce them in this way to a hive that has just had a laying queen taken from it, is a little more uncertain, yet we have done it, and there is one very decided advantage in so doing; because the colony will then, at no time, be out of unsealed brood.⁴⁷ The saving in time by giving a colony a bright live queen, instead of a queen cell which may not hatch inside of 3 or 4 days (perhaps not at all), is quite an item. The first queen that hatches, one would suppose, would tear down all the rest of the cells, as she does in the hive; but such is not the case, where there are no worker bees present, as in the lamp nursery. It is true, we occasionally find a queen tearing open the other cells when left too long, but not often. They do sometimes, also, sting each other; but, if they are looked after the first thing in the morning and the last thing at night, very few will be lost from this cause. Some unsealed honey should be found in the cells, for these queens are very fond of a good "square meal," about as soon as they have had time to stretch themselves. I have noticed that they seem to have a preference for newly gathered, thin honey, and as the honey in the open cells gets quite thick after being exposed to this high temperature, it has lately occurred to me, that some diluted honey, as soon as they are hatched, might be better for them.⁴⁸

INTRODUCING VIRGIN QUEENS.

Although these young queens, like newly

hatched chickens, or young puppies and kittens, are disposed to take up with the first animated object they set their eyes on, yet there has been considerable trouble in introducing them. With weak stocks or nuclei, that have been a day or two queenless, there is little trouble, and, in fact, the bees of a large colony will allow these young queens to crawl in without a word of objection at the time, in the majority of cases, but when they get a day or two older, then comes the difficulty. I have not been able to discover how the trouble comes about, but so many of them are found in front of the hive, either dead or just able to crawl, that I have rather given up introducing them to full stocks, unless they have been some time queenless.

To our old friend Langstroth, the credit principally belongs, I believe, of discovering that virgin queens could be introduced generally when first hatched. The following valuable account of it, I extract from the *American Bee Journal* for July, 1871:

ON THE INTRODUCTION OF YOUNG QUEENS TO COLONIES THAT ARE QUEENLESS.

Some ten years ago, I was led to suspect that the ordinary statements of Huber and other eminent apianians, with regard to the antipathy of bees, under all circumstances, to a change of queens, was incorrect. Eminent writers have supposed that it would not be safe to introduce even a queen cell to a colony until twenty-four hours had elapsed after the old queen had been removed.

In experimenting with Italian bees, shortly after their introduction to this country, I soon ascertained that this was an entire mistake, and that queen cells could be safely introduced, under ordinary circumstances, immediately after the removal of the queen.* This led me to experiment further in the same direction. Supposing that perhaps the hatching of a young queen in the colony might reconcile them at once to her presence, I introduced to queenless colonies cells, the lids of which were being gnawed open by the young queen. In some instances these queens hatched in less than five minutes after the cells were inserted, and I found them to be unmolested, although the hive had been unqueened but a few moments before their introduction.

I now began to suspect that there might be something in the young queens themselves, either in their actions, or in their odor, or their voice, or want of voice, which made the bees indisposed to disturb them. Therefore, after unqueening the hive, I introduced just hatched queens at once, and found them almost invariably well received. The bees would occasionally seem to manifest some surprise at their presence, and probably, if they could have spoken their feelings in words, would have said inquiringly—"Does your mother know you are out?"

* Instead of the circumlocution of saying—removing a queen from a hive, or giving a queen to a hive—I propose to use as more definite terms, the words *unqueening a hive*, or *queening a hive*.

If the queens were too young, they were sometimes dragged out of the hive, just as imperfect bees are removed by workers. I next discovered that, in many instances, these young queens could be put upon the very comb where the old mother was, and yet be undisturbed by the bees. In order to test this matter more thoroughly, after introducing a just hatched queen and finding her well received, I would place upon the same comb an unfertile queen several days old. The bees would at once attack her furiously, confine, and speedily destroy her. It would seem, therefore, that under ordinary circumstances, young queens which have not yet attained their proper color, and perhaps the power of piping, may be introduced at once to queenless colonies. I have availed myself of this discovery largely, in breeding Italian queens; it being a common practice with me as soon as the queen of a nucleus has laid a suitable number of eggs to test her purity, to cage her, and at once introduce a queen not more than five or six hours old. It may be that it would be safe to introduce queens even a day old, but my practice has been to select for this purpose such as had very recently hatched. When the young queen thus introduced becomes fertile, and has laid a proper number of eggs, I cage her in turn and introduce still another. And thus I am able, with one nucleus, to accomplish in queen raising, as much as is ordinarily done with two or three.

Occasionally I have known the workers to destroy these young queens, if not immediately, still within a few hours after their introduction. I do not, therefore, recommend the practice above described to those who have very few queens, nor would I risk a young queen which I valued very highly. But, as under ordinary circumstances, the breeder has often more queens than he knows what to do with, he can easily dispose of them in the way above described.

In order, at times, to secure a suitable number of queens for this purpose, I have been accustomed to condense into one colony a very large number of queen cells of about the same age, inspecting the colony about every hour in the day, and removing queens as fast as they hatched, and before they had an opportunity to destroy each other or the other queen cells. These same combs may be returned at night to their proper nuclei.

The expert will know how to avail himself of the plans which I have suggested, and how to modify them to suit his circumstances.

L. L. LANGSTROTH.

Oxford, Ohio, June, 1871.

It may be well to remark, that these virgin queens are introduced to full blood Italians, with much less trouble than to either blacks or hybrids; they are also accepted by a small colony or nucleus, better than by a full hive; and by any hive that has been a day or two queenless, better than by one from which a laying queen has just been taken. With the lamp nursery it is an easy matter to raise queens by the thousand, at a cost generally not exceeding 25c each; but the most expensive part of the work comes afterward—getting them fertilized. At present, I know of no better way than the one given in QUEEN REARING AND ARTIFI-

CIAL SWARMING (giving each queen a small colony); but we shall doubtless make rapid progress in the matter, if the demand for queens continues to increase, as it has of late.

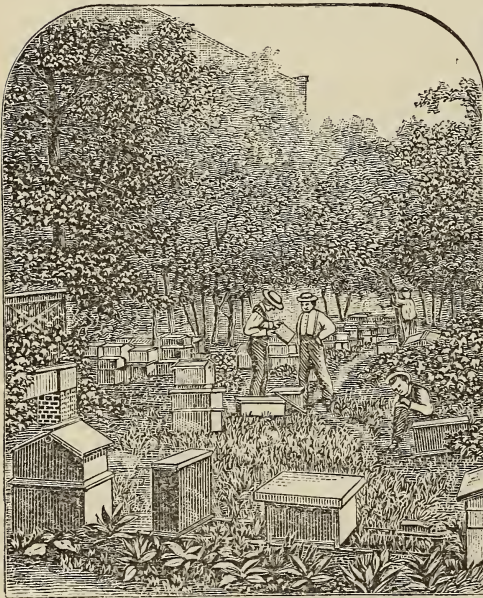
The introducing part of the lamp nursery plan of rearing queens is the one great obstacle, and it is evident that there is something about it not fully mastered; for, at times, we succeed so nicely with every queen, that it seems as if there were no need of failures at all, but again, almost every queen is lost. It was suggested, a few years ago, when these queens hatched by artificial heat were first put into the market, that they would prove less hardy; but I believe that such has not proven to be the case, for some of our best stocks have been built up from these, and they have proved just as long lived as any.

After your combs have been in the nursery a few days, you will have to keep a look out for moth worms, or they will get into your queen cells, and make trouble. See BEE MOTH.

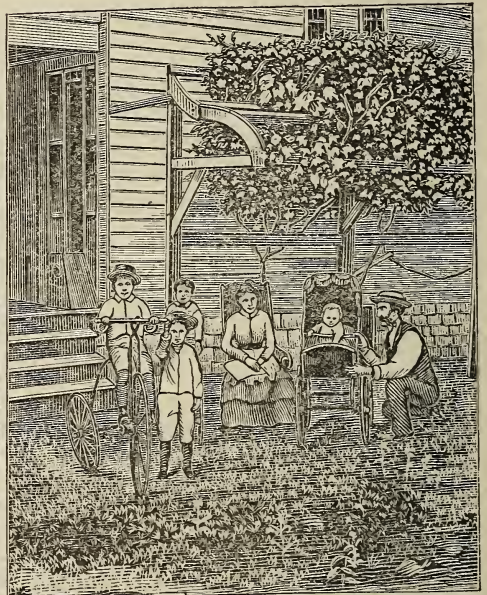
LOCUST. This tree is so well known as scarcely to need a description. It grows very rapidly, and bears blossoms at a very early age, and could we be assured of having regularly the crop of honey that the locust bears perhaps one year in five, I should at once plant a locust grove exclusively for honey. It blossoms profusely, almost every season, but often, the bees pay no attention to the flowers at all.

The honey comes at a time, when it is very much needed, as it is a little later than the fruit bloom, and a little earlier than white clover. If anything could be done, by a selection of different varieties, or by cultivation, to make it bear honey every season, a locust grove would be a very valuable addition to the honey farm.

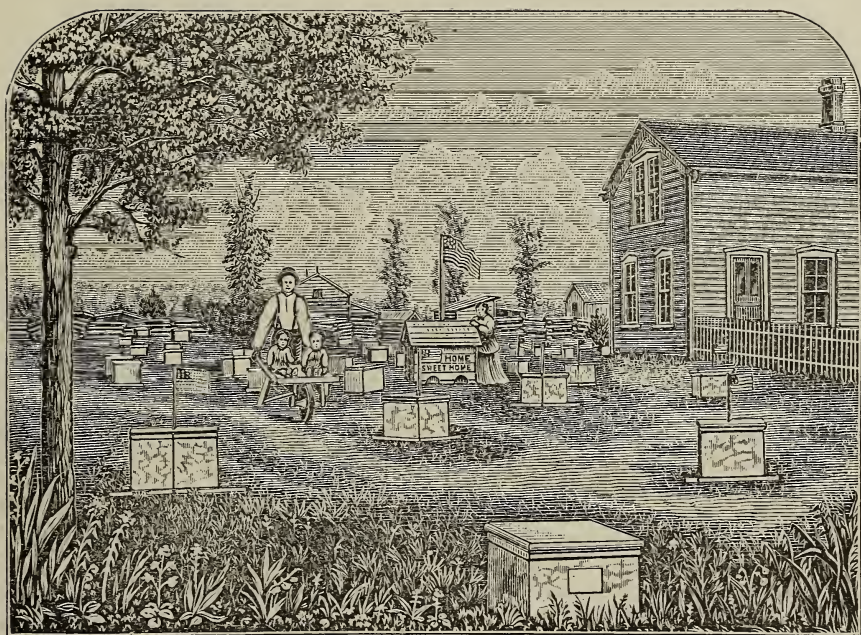
The leaf of the locust much resembles the leaf of the clover, only it has a great number of leaves on a stem instead of only three; the blossom is much like that of the common pea, both in appearance and size. It is an interesting fact, that the locust, pea, and clover all belong to the same order, *Leguminosæ*.



SUNNY "SIDE" APIARY, BELONGING TO C. H. LAKE, BALTIMORE, MD.



THE OTHER "SIDE" (OF THE HOUSE) ALSO BELONGING TO FRIEND LAKE.



STILLMAN-CO. CHICAGO.

W. Z. HUTCHINSON'S APIARY, ROGERSVILLE, GENESEE CO., MICHIGAN.

M.

MIGNONNETTE (*Reseda odorata*).

We have had little practical experience with this plant, beyond a small patch of the tall variety in the garden. Although this kind did not have the perfume of the ordinary small kind, it was humming with bees for months; and, as they work on it all day, it will prove valuable for keeping them busy during the fall months. The following we extract from Lane's catalogue.

"If cultivated to that extent that it might or ought to be, it would certainly furnish a rich pasturage for bees. A small patch of it will perfume the air for quite a distance; and were it cultivated by acres for bee pasturage alone, we should be favored with a fragrant atmosphere that would vie with the spicy breezes of Ceylon, and a honey that would outdo the famed honey of Hymettus for aromatic flavor.

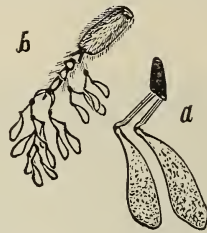
"It blossoms in the latter part of June and continues in bloom until cold weather (heavy frosts do not injure it); indeed, we are informed by our Southern friends that with them it continues in full bloom during the entire winter. There are many varieties, but we think all are inferior, for field culture, to Parson's New Giant. The seeds, which are very small, should be sown in the spring, sowing thinly and covering lightly, in drills at least three feet apart. Would not advise sowing broadcast."

December, 1879. We have had a half-acre on our honey farm, of different varieties, during the past season. Although visited by the bees for several months, at all hours in the day, it has not compared at all with the Simpson honey plant. A small patch in the garden, on very rich soil, did very much better.

MILKWEED (*Asclepias Cornuti*). This plant is celebrated, not for the honey it produces, although it doubtless furnishes a good supply, but for its queer, winged masses of pollen, which attach themselves to the bee's feet, and cause him to become a cripple, if not to lose his life. Every fall, we have many inquiries from new subscribers, in regard to this queer phenomenon. Some think it a parasite, others a protuberance growing on the bee's foot, and others a winged-insect enemy of the bee. We give below an engraving of the curiosity magnified at *a*; and also of a mass of them attached to the foot of a bee.

It is the same that Prof. Riley alluded to, when he recommended that the milkweed

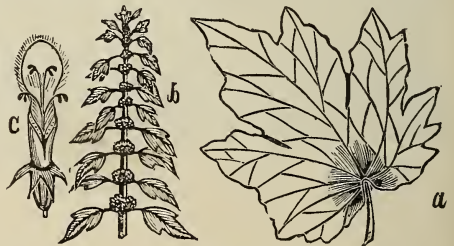
be planted to kill off the bees when they became troublesome to the fruit grower. The



POLLEN OF THE MILKWEED, ATTACHED TO A BEE'S FOOT.

folly of such advice—think of the labor and expense of starting a plantation of useless weeds just to entrap honey bees—becomes more apparent, when we learn that it is perhaps only the old and enfeebled bees that are unable to free themselves from these appendages, and hence the milkweed can scarcely be called an enemy. The appendage, it will be observed, looks like a pair of wings, and they attach themselves to the bee by a glutinous matter which quickly hardens, so that it is quite difficult to remove, if not done when it is first attached.

MOTHERWORT (*Leonurus Cardiaca*.) Quite a number of the bee folks insist that motherwort is superior, as a honey plant, to either catnip, hoarhound, balm, wild bergamot, or any of the large family of Labiatae, and I presume such may be the case under some circumstances, or in favor-



MOTHERWORT.

able localities. In comparing plants, it should be remembered, that those which

usually bear much honey may, at times, furnish none at all; and also those which usually furnish none may, under very favorable circumstances, yield largely.⁴⁹

This plant often flourishes about fence-corners, and around the ruins of old dwellings, sheds, or even hog pens. The large leaf, taken by itself, much resembles the currant; the stalk is much like catnip; and the little flowers are in tufts, close to the stalk. It remains in blossom a long time, and may be as worthy of cultivation, as any of the plants of its class.

MOVING BEES. Perhaps about as many mishaps, especially with beginners, have come about from moving bees unwisely, as from any other one cause. A little thought in regard to the habits and ways of bees would save much of this. Bees fly from their lives in quest of stores, perhaps a mile; sometimes a mile and a half or two miles; but they will seldom go beyond these limits, unless at a time of great scarcity of pasturage.⁵⁰ Well, after a bee has once fixed his locality, he starts out in the morning on a run, and never stops to take the points, as he does the first time he sallies out from a new locality. The consequence is, if you have moved his hive, either in the night or day time, and have not moved it more than a mile, he will, when he goes back, strike directly for his old locality. On reaching there and finding his hive gone, he is lost and helpless; and even though the hive may be but a few rods away, he will never find it in the world. New hands frequently move their hives close together at the approach of winter, that they may better protect them with chaff or straw. I do not know how many times mishaps resulting from this kind of proceeding have been related to me. All goes very well, perhaps, until we have a warm day; then the bees start out for a fly, and very naturally return to their home just as they have been doing all summer; if no one is near to restore their hive to its former location, they fly helplessly around for a while, and then alight on the trees and fences, scattered about, and finally perish. If other hives are near, they will get into the wrong hives and get stung; or, if their numbers are great enough, they will sting the queen because she is a stranger to them. Sometimes the bees of the whole apiary will become so mixed up, that they have a general melee and fight, resulting in great damage, if not in the destruction, of many of the swarms. Moving hives short distances during the working season is almost always

done with loss of more or less bees, and consequently honey.

It is true, bees may sometimes be moved without loss, for there is quite a difference in the disposition of colonies, and where one may be moved all about the yard without any apparent loss, the next may suffer, if moved only a few feet. I once purchased a very strong colony of blacks of a neighbor, and to be on the safe side, moved them on a cold day in Dec. I should think it was a week afterward, when it became warm, and the bees went back to their old home in such numbers, that the first cold night froze out the remaining ones, and I lost my stock entirely. At another time, a neighbor wished me to take a swarm from a very strong stock of blacks. As I had but little time, I set another hive in its place, containing a frame of brood and a queen cell, and moved the old one several rods away. He told me next day that the bees had all found their old home, and deserted the brood comb entirely. I directed him to move it again, and place it the other side of the orchard, but it seems these wily blacks had learned the trick, for they all found it even there. Italians, as a general thing, are more ready to take up with a new location than the blacks, and stick more tenaciously to their home and brood.

Sometimes, shaking the bees all in front of the hive, and letting them run in like a natural swarm, will answer to make them stick to their new locality; at other times, moving the hive away for an hour or two, until they get really frightened at the loss of their home, will have the same effect, after it is once brought back to them. In this case, they seem so glad to get their dear old home again, that they will adhere to it wherever it is placed. Neither of these plans can be relied on implicitly, and I really do not know of any that can. Sometimes we succeed by leaving a comb for the returning bees to cluster on, and then take them to the new stand just at night fall. When allowed to run in, they exhibit their joy by loud notes of approval, but, just as likely as not, they will be back at the old spot the next day, just the same. With patience, we can by this means save most of them. As a natural swarm will stay wherever they are put, anything that reduces a colony to the condition of a natural swarm will accomplish our object. Bees depend very much on the surrounding objects, in taking their points; and I have known a whole apiary to be successfully moved a short distance, by moving all the hives, and preserving their

respective positions with reference to each other. Carrying bees into the cellar for several days or a week will usually wean them from their location, so that they may then be located anywhere, but this plan is objectionable, inasmuch as the colony is prevented for that length of time, from doing any work in the field, and this is quite an item in the height of the season. Where we wish to divide a swarm, the matter is very easy, for we can carry our stock where we wish, and start a nucleus of the returning bees. The usual way, and by far the easiest where it can be done, is to wait until winter, and move them after they have been confined to the hive for several weeks by cold weather. Bees moved in the spring seldom go back to their old quarters, for they generally take their location when they take their first flight, whether they have been moved or not. Bees can also be moved short distances, in warm weather, by taking them a mile or more, leaving them a couple of weeks, and then bringing them back to the spot where you wish them to remain. This plan, with me, would be too much trouble and expense to be practicable generally.

Where the new location is a mile or more distant, they can be moved any time, and I have known them to be moved only a half a mile, without any noticeable number going back to their old locality. If bees are to be moved during hot weather, great care should be used that they be not smothered and their combs melted down by the intense heat that is generated where they have an insufficient quantity of air. After many mishaps in shipping bees in the summer time, we have now decided on covering both the top and bottom of the Simplicity hive with wire cloth. When thus prepared, we have never had any trouble, even when shipping them during our hottest July and Aug. weather. When we depended on wire cloth over the top only, or over the portico of the old style L. hives, we have invariably heard that the combs were melted down, and that the honey was running out at the sides of the hive. Allow a draft of air right through the hive, and the bees will take care of themselves, and the combs filled with honey. As the chaff hive will not admit of this arrangement, I would recommend that the bees be taken out, in very hot weather, and shipped in the Simplicity hive; that is, just the body, without any top or bottom. If you are purchasing bees in a common box hive, you can turn the hive over, and tack wire cloth over

the bottom; but if the colony is a powerful one, and the weather hot, I would much rather have a wire cloth covered opening in the top, as well as bottom. The hives, when thus prepared, may be carried in a spring wagon or buggy, or even in a lumber wagon, if you drive slowly. Where it can be done, I would spread straw under the hives and pack it around the sides; this will prevent jolting.

Of course every comb is to be made perfectly secure, where the bees are to be shipped by rail, or entrusted to any who may not give them careful handling. We fasten the metal cornered frames, by sticks placed at each end of the frame. These sticks are 10 inches long, by about 7-16 inch by $\frac{1}{4}$. For a 10 frame hive, you will need 22 sticks. Put the first two against the side of the hive tight up in the corners, then a frame of comb, and another pair of sticks. When all the combs are in, the last two sticks are to be made a little wedge-shaped at their lower ends, and pushed down hard between the comb and the side of the hive. The frames should be so tightly wedged, that the whole may be tipped about in any direction. You are now ready to tack on the wire cloth. We use a cheap, painted wire cloth. If the cover, bottom board, quilt, enameled sheet, etc., are to go with the bees, I would attach them to the bottom with strips of lath, leaving a space of an inch for the air to circulate between the lower wire cloth and the attachments. If the upper story is to be sent with the hive, I would make a separate package.

It is quite important that none but old and tough combs be used, when shipping bees by rail. The beautiful new combs built on the foundation would be very nice to send out to customers, but they would be almost sure to break down, unless wired as on page 47. Bees *can* be sent by freight, and I have sent them safely in that way, as far as Massachusetts; but, as a general thing, I think I would risk them only by express.

Where bees are to be moved in a wagon or buggy, and the colony is an old one with the combs all bridged over from one to another, I would not go to the trouble of putting the sticks in, for I have always found them to move safely without, even if they are in metal cornered frames. Have them well ventilated and handled carefully, of course.

If bees are to be sent long distances, be sure they have a good supply of stores, for the excitement attendant on the confinement and jolting about will sometimes cause them to consume honey enormously. On

this account I would be very careful about moving bees needlessly. Carrying bees into cellars and out again many times during the winter, I should object to, just on this account; especially, if we can winter them just as well without so doing. Fix a permanent stand for your bees, give them a good chaff hive, and they, as well as yourself, will be spared much annoyance, if they can be allowed to remain there year after year.

If you wish to move bees during the day time, while many are in the fields, you can get them nearly all in, by smoking them at intervals for about a half hour. This will give those that are out time to come in, and the smoking will prevent any more going out. If the colony is a very strong one, leave a hive with a comb of brood on the old stand, and the owner can start a nucleus very conveniently with the returning bees.

It is quite desirable that the express agents should handle bees carefully, and the sight of them buzzing about just under the wire cloth is, usually, a guarantee of safe handling; but, as many do not know how to handle and take care of bees, we have of late had a large printed card tacked to all the hives and nuclei sent out. Since doing this, we have never had any complaints of damage in transit. The card reads as follows:

KILLED!

This hive contains Live Bees, and they will be "killed" if roughly handled, or left in the sun, or not kept this side up. Will you please be careful of the little fellows?
A. I. ROOT, Medina, O.

As soon as you receive bees, place them at once where they are to stand permanently, and let them out as quickly as possible. They will buzz about, and make quite a stir for a while, but all will get back to their hive safely; for their buzzing about is just to mark their new locality, as we described in BEE-HUNTING. Set the hive level, and I would have it square and true with the points of the compass. Set it on the bottom board, loosen the wire cloth where the entrance is to be, and then let them remain, until they get acquainted with the surroundings a little. Next day, if you choose, you can take off the wire cloth, and remove the sticks, using smoke, of course, to keep them out of the way. When this is done, put on the enameled sheet and cover, and adjust the hive on the bottom board so that the bees can get out and in comfortably, but do not make the entrance larger, unless the weather is extremely warm. Your next work is to learn to handle the frames, and

to get acquainted with the bees. If you should take the frames out and look at the queen, and see how they get along with brood rearing, etc., every day, I should be much more sanguine of their prosperity, than if you only looked at them once a week. After they are accustomed to your daily and careful handling, you will find that you can get along without smoke, veil, or any thing of the kind.

MUSTARD (*Sinapis arvensis*.) This belongs to the same family as the turnip, cabbage, rape, etc., all of which, I believe, almost invariably furnish honey while they are in bloom. We have a good opportunity of testing these plants, because acres of them are raised for other purposes besides the honey. It will be a hard matter to determine which is best for your locality, without trying a plant of each. Find out what kind of a market you have for your seed, and then proceed to raise it, as if you were going to depend on the seed alone to pay expenses. Should you secure a good crop of honey from it, you will then be so much ahead, and there is little chance of any great loss.

The honey from these plants is said to be very light, equal to any in flavor, and to command the highest price in the market. The seed should be sown very early in the spring, either in shallow drills so far apart that the cultivator can be used between them, or broadcast. The former plan is, of course, the better one for nearly all honey plants, but is more trouble. From 6 to 10 lbs. per acre will be needed, if sown in drills, and from 15 to 20, if sown broadcast. If you wish to save the seed, it should be sown not later than July 1st. When the greater part of the pods are ripe, the stalks are to be cut and carefully dried. A cloth should be spread in the bottom of the wagon, when gathering, for the seed will shell out considerably, if it is in proper condition to thresh. I presume we have machines especially adapted for cleaning and threshing the seed, but I have always seen a flail and fanning mill used. Of course, it should be threshed on a tight floor, or on a floor made tight by a large piece of canvas. The seed of the common kinds of mustard brings four or five dollars per bushel. I do not know how many bushels are raised per acre. The Chinese variety has been highly extolled for bees, but we have found the common black mustard that grows almost of itself to thrive better, and be more visited by the bees. Who will give us the results of some practical experiments?



A RAILROAD APIARY, BELONGING TO M. A. WILLIAMS & CO., BERKSHIRE, N. Y.

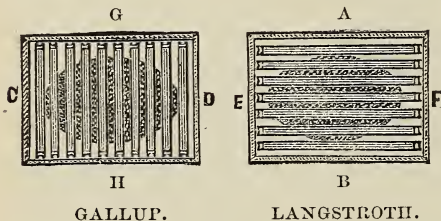
N.

NUCLEUS. This word, applied to bee culture, signifies a small swarm of bees, perhaps from one-fourth to one-tenth of a full colony. The plural of the word is nuclei; it were well to bear this in mind, for there is much confusion in the use of the terms, even in printed circulars. If you remove a dozen bees from the hive, take them so far away that they are homeless, and then let them fly, they will after a time come pretty nearly back to the place from which you released them; but unless they have a queen with them, they will soon wander away and be lost. If you give them a queen, they will come back to where they left her, and will probably remain if *she* does not stray away. She, like the rest, must fulfill her destiny, or she will wander away; we shall therefore have to provide her a comb wherein to lay eggs. The bees would build the comb themselves, if there were enough of them, and they had plenty of food. A dozen would never build any comb; neither would they make any attempt to rear and hatch her eggs, if the comb were given them. Perhaps a hundred bees put in a suitably small box, with a fertile queen, might start a colony, and this is what we call a nucleus.⁵¹ It is the center about which a colony of bees may in time be formed. If they should be built up to a full colony, the building up would be done by the queen's filling her combs with eggs, which, when cared for by the nursing bees (see **BEEES**), would be converted into larvæ, and in 21 days, would be hatched into perfect bees. These bees would then help the original hundred, and the queen would fill a still larger area with eggs, which would be hatched in the same way, and so on. The difficulty in the way of building up from such small beginnings seems to be that the queen will lay all the eggs a hundred bees can care for, perhaps, in an hour or two, and then she has to sit or loaf around for the whole 21 days, until she can have another "job." Before the 21 days are up, she will be very likely to get disgusted with such

small proceedings, and swarm out, or at least induce the bees with her to do so. See **ABSCONDING SWARMS**. If we should increase the number of bees to 500 or 1,000, we would get along very much better, and there would be little danger of swarming out, unless the hive given them were too small. A very spry and ambitious queen might fill all the cells the bees had prepared for her, then set about filling them the second time, as they sometimes do, and then swarm out; but, with a quart of bees—about 3,200, if I have figured rightly—things will generally go along pretty well.

If we are to have this quart of bees work to the best advantage, something depends upon the sort of hive they are domiciled in. A single comb, long and narrow, so as to string the bees out in one thin cluster, is very bad economy. Two combs would do very much better, but three would be a great deal better still. It is like scattering the firebrands widely apart; one alone will soon go out; two placed side by side will burn very well; and three will make quite a fire. It is on this account, that I would have a nucleus of three, instead of one or two frames. The bees seem to seek naturally, a space between two combs; and the queen seldom goes to the outside comb of a hive, unless she is obliged to for want of room. Is not the Langstroth frame then a poor shape for building up nuclei? and would not the small Gallup be better? The L. frame is a bad shape for two or three frame nuclei, and, for that matter, I think the Gallup is also.⁵² The one is too long, and the other too deep; in one case, we have the ends extending beyond the cluster, unless we contract the hive so as to crowd the bees out to the ends, and, in the other case, the bottom of the frame extends below the cluster.⁵³ This matter of deep and shallow frames seems not to be very well understood, if I may be excused for saying so much. If you will examine bees at the approach of frosty weather, you will see, from the way in which they

draw up and condense, how their combs need to be proportioned. To have them stand the rigors of severe winter weather, they should fill their hive as nearly as possible, and there should be no cold unfilled spaces either at the ends, or underneath the cluster. If their hive is so full that bees are standing in the doorway, even during severe cold weather, we need have little fear of their suffering. Now, with a shallow hive, they will come clear down to the bottom-board, and keep that warm as well as the ceiling over head. With a frame as deep as the Gallup, I have not succeeded so well in making them do it. Nor can I succeed so well with any frame, whose depth is as great as the width. The warm combs are at the sides of the bees, and the open ends between the combs, are at the ends of the cluster. The diagram below will help to make it plain.



GALLUP.

LANGSTROTH.

It is very plainly evident that the sides of the clusters, A B and C D, are much better protected than the ends, G H and E F; and also that the long frames protect the center of the brood nest much better than the short ones.⁵⁴ Taking this fact into consideration, in connection with what has been said of the importance of a shallow frame, and we shall have just about the dimensions of hive and frame given us by Mr. Langstroth; and, if I am correct, all these things were taken into consideration, when he settled down on his frame and hive, after years of careful experiment in regard to different sizes.

Well, if the L. frame is the best economy for the average progeny of a queen, we must have a smaller frame in just about the same proportions, if we wish to work with nuclei to the best advantage. As we cannot well have a frame for a pint of bees, and another for a quart and so on, on account of the complication it would make in an apiary, it behooves us to discuss well what sizes we shall use, if any, less than our regular frame. A frame as deep as the usual one, and as wide as the *width* of our hive, makes a very pretty frame for queen-rearing.

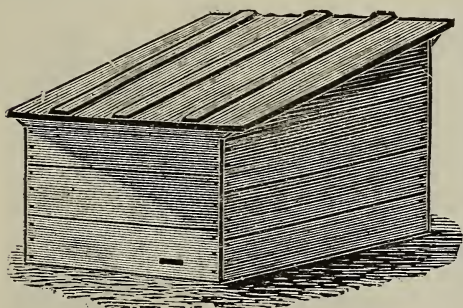
The Gallup frame would do nicely, and, in fact, is much used for this purpose, but it

is too deep; were it cut down to the depth of the L. frame, I should like it much better. A frame has been suggested, and I believe somewhat used, for a nucleus hive, of the depth of the L., and just wide enough to go crosswise, in the Simplicity hive. An ordinary hive with a rabbit along the sides, as well as across the ends, will hold these frames or the usual L. frames, as may be desired. If it should be desired to use this small frame entirely in an apiary, the size is exactly right to hold 6 of the 11b. sections.* When used for queen rearing, 3 of these small frames will make a very comfortable nucleus. One of the prettiest queen rearing apiaries I have ever seen, was composed of about 50 three-frame hives of this description.

Although I have described this small frame, and spoken of its advantages, please do not understand that I would advise you to adopt it. If I were going to have two-sized frames in my apiary, I would adopt just these, without question—the large one for honey and the small one for queen rearing. But can we afford to have these two sizes, even if they do both hang in the same hive? Before answering, I would state that I have worked for years with two or more kinds of frames, in the same apiary, and have multiplied, divided, and united again, until I think I have had experience in nearly all the changes that come about, and each year I grow more determined that I will have but one-sized frame in the apiary, and no odd ones any more, *under any circumstances*. This one size shall be the L. frame I have given you, and if I should sell all my bees to-day and start anew, I would use this without hesitation. If this is our determination, it behooves us to see what can be done toward ameliorating the objections to the long and large L. frame. Strong nuclei will do it without question, and if one wishes to make his queen business a sure thing, without the vexations of swarming out, robbing, etc., there is nothing like strong nuclei, to take care of themselves. For queen rearing, I would have the ordinary Simplicity hive, one story, with a division board,

*A chaff hive made to hold these small frames below, and the usual Langstroth frame above, solves the problem of a chaff hive having the upper and lower frames running the same way, the only objection being that we have two sized frames in the same hive. By lifting out two or three of the upper frames, we can at any time get at the brood frames below, without taking *all* the combs from the upper story, as we have to do in the regular chaff hive. I only offer this as a suggestion.

and then the increase can readily be accommodated, and all that increase to a full swarm are all right, without any changing and shifting of hives. If desired, two nuclei can be put in one hive, by using a tight division board, and making the entrances at either end. This plan does very well, but there is more danger of the swarms mixing, than where separate stands are used for each hive. The rustic chaff hive, given below, seems nicely adapted to this purpose, and from the fact that it gives protection in cold weather, it is much better than a single walled hive like the Simplicity.



CLARK'S RUSTIC CHAFF HIVE.

The nucleus hive shown above, I first saw in use at the residence of Mr. Geo. Clark, Medina, O. The following description is from the Sept. GLEANINGS for 1878.

When I first came into the yard, I was inclined to laugh at his home made chaff hives. Our artist went over and made a drawing of one, which is shown above.

When our friend tumbled the cover off of one, and took out the clean chaff cushion and laid it on the cover, revealing two, fine, 4 frame nuclei, for rearing queens, I changed my mind about them. The inside is just like the inside of any L. hive, only that he had a partition board that extended a little higher than the sides. Some pieces of carpet, of just the right size, covered the frames of each side. The entrance to one colony is shown in the cut; the other is exactly like it, on the opposite end. I remarked that such hives would be exactly the thing for rearing queens in cool weather, and that they would winter there without any doubt. He replied that two stocks had wintered in each one of them, without any trouble so far.

The beauty of this chaff hive is that it costs almost nothing. Any old boards will do to make it; even if the cracks between the boards are so open that the rain beats in, it would soon dry out; the overhanging roof, which is made of rough, unplanned boards, like the rest, would probably shield it from the greater part of the storms. Any old, black, rough boards will make the outside, but the inside should be made of $\frac{1}{2}$ inch stuff, planed at least on the inside. The dimensions inside should be very accurate, to hold the L. frame.

The bees will winter in a hive like this, almost as well as if the two were in one clus-

ter; for, if the division board is of thin wood, they will cluster up against it on both sides, on account of the mutual warmth felt through the board by each. In using hives with a division board between two colonies, great care should be used in making the division board tight. I do not know how many failures have resulted from having the board shrink or warp, and thus let the bees through. Although wire cloth has been made to do in a few cases, it will not do to depend on it. Sooner or later, the bees will kill one of the queens, and behave themselves as one colony. I have raised queens, one in each side of a hive, both nuclei using a common entrance, with no division board at all, but such cases are exceptional.

The above arrangement does very well so far as queen rearing is concerned, but where nucleus colonies are to be sold and shipped, we must have a little 3-frame hive on purpose. These are to be as light as possible, consistent with strength, to save express charges, and, for the same reason, should be as simple as possible.



3-FRAME NUCLEUS HIVE.

A sheet of enameled cloth, hemmed at the sides and ends, is made to lay over the frames, as in the large hives, but the cover is made to shut over the hive. These hives answer perfectly for rearing queens during the warm months of July and Aug., and one of them will be found on a shelf attached to the trellis, in the engraving given under QUEEN REARING. No bottom is used to the hive, the shelf that it rests on being bottom enough; the front board is made $\frac{1}{4}$ inch shorter than the sides and back end, to form the entrance. When the bees are to be shipped, the cover is placed under the hive, closing the entrance, and a piece of wire cloth, is tacked over the top, after having fastened the frames by pushing sticks of proper size between them. In these small hives, this gives ventilation enough. For 3 frames, the hive should be $4\frac{1}{2}$ inches wide inside.

There is still another reason for using a nucleus hive with full-sized frames, and it is that those who purchase valuable queens in a nucleus, to save the risk of introducing, usually wish to build them up at once, to full colonies; with an odd-sized frame, this would be very inconvenient.



A SCOTTISH APIARY.

P.

POISONOUS HONEY. Honey may be poisonous in two ways. It may be poisonous for human beings, and not for the bees, or it may be poisonous to both bees and humanity; in the latter case, it could not well happen that we should suffer very much, for the bees would die before they could make any accumulation. It has been reported that the honey from certain blossoms, such as the *Ailanthus*, poisons the bees, even before they can get away from the tree; but, so far as I can learn, this is a mistake.

The wild honey of the Southern states, in many localities, is quite liable to produce sickness, and, in some instances, this sickness has been so sudden and violent, as to give good grounds for thinking that the honey was obtained from poisonous flowers. The following is from Feb. GLEANINGS, for 1875.

Wherever the mountain laurel grows, the bees are very fond of it, and laurel honey is not confined to the *wild* bees, for the tame ones will also resort to the flowers, and it is dangerous, for any one unable to detect the taste, to eat the honey. It has a highly poisonous effect, being an extremely distressing narcotic, varying in its effects in proportion to the quantity eaten. During the war, as a surgeon in the Confederate army, and campaigning a good deal in *the Valley* (as we call it), I had many opportunities of witnessing its effects, and on one occasion, personal experience gave me the right to say that I know something about it, as well as your correspondent. He says he only *tasted* it, but not being forewarned, or rather, not being acquainted with the taste of the "laurel honey," I ate a small quantity of it, and was prevented by the disagreeable taste from eating more. My comrades, equally ignorant, and not quite so fastidious, indulged more freely, and consequently suffered in proportion. I do not remember very distinctly the symptoms, but as nearly as I can recall them, my sensations were these:—some time after eating, a queerish sensation of tingling all over, indistinct vision, caused by dilation of the pupils, with an empty, dizzy feeling about the head, and a horrible nausea that would not relieve itself by vomiting. In my case this lasted perhaps an hour, but my companions were worse off, and complained of the symptoms two or three hours. They however had not eaten enough to suffer as much as I have seen others. The first cases that I saw were entirely overpowered by it, and their appearance was exactly as if they were dead drunk, and I should certainly

have pronounced them so, had not their messmates assured me to the contrary, and had I not discovered that they were rational and sensible of their condition, as shown by their imperfect efforts to articulate. To speak technically, the innervation of all the voluntary muscles was completely destroyed. The use of the usual remedies, or antidotes for narcotics, partially restored them in a few hours, but the effects did not entirely wear off for two or three days, and I was assured that fatal consequences have been known to follow a too free indulgence in the sweet but treacherous product of the "models of industry."

Where there is no mountain laurel to poison their honey, the wild bees of Virginia can make as good honey as any others. Of course the quality of the honey varies with the character of the flowers from which it is made, and I have seen as good honey from a bee tree on the edge of a field of clover as perhaps the bees of *Hymettus* ever made.

Halifax C. H., Va.

J. GRAMMER, M. D.

POLLEN. Doubtless, you have all heard bees humming about hollyhock blossoms, but perhaps most of you have passed on, thinking that it was nothing strange, for bees are always humming about flowers. Suppose we stop just a minute, and look into the matter a little. The bee, although on the wing, is almost motionless as he hovers about the dust in the centre of the flowers, and by careful watching, we may see that his tongue is extended to a considerable length. This tongue looks much like a delicate pencil brush as he sweeps it about among the grains of pollen, and as the pollen adheres to it and is from time to time put away somehow, we are led to infer that there must be something adhesive on it. I believe the bee, when he starts out to gather pollen, does carry along a store of honey for this very purpose. Well, we will suppose he has moistened his long, flexible, brush-like tongue with honey, has spread it out and brushed it among the pollen grains and then—I rather think I shall have to give you some pictures before I can well explain to you what happens next. See next page.

Fig. 1 is a collection of pollen grains highly magnified, and A is exactly the kind the bee finds in the hollyhock. Fig. 2 is the tongue of the bee, and Fig. 3 is one of his fore feet, just to show you what a funny machine he is provided with, for getting the pol-

len off his tongue. There is a little blade, as it were, at B, that opens and shuts, and the bee, when his tongue is well loaded, just claps it into the grooved or fluted cavity, C, then shuts down B, and gives his tongue a "wipe," so quickly that he leaves sleight-of-hand performers all far in the shade. I believe he generally wipes his tongue with both fore feet at once, and when he does this, his appearance, viewed through a glass, is comical in the extreme. Suppose you were to take a feather duster, dip it in honey, and then roll it in currants. It would be a big job to pick these currants off, one at a time, but if you should put the handle of the duster in your mouth, you might, with the thumb and forefinger of each hand, strip them all off clean at one "lick," and then your duster would be ready for another "dip." This is just the way the bee does it, but he has rather the advantage, for his thumb and finger are fluted or grooved, in the way I have explained, that he may be able to sweep off his tongue "slick and clean," without hindrance. Now it is another "knack" he has, of getting it into his pollen baskets, after he gets it off his tongue.

You will see that, should he not moisten the pollen into a kind of paste or dough, he would never be able to make it stick in such a place. Well, it does sometimes tumble off, especially if he takes very heavy loads, or has an inconvenient entrance into his hive. I have seen quite a large heap of pollen, just in front of a hive, when the entrance was so badly arranged as to cause the bee to scrape it off when going in. All kinds of traps and rigging, to prevent the drones and queens from going out and in with the workers, have been objectionable on this very account.

Well, between the pollen-gathering legs and the pollen-basket legs are another pair. These play a very important part in getting the pollen into the pollen baskets. With the tongue, fore leg, and middle leg, the bee pads up the pollen and honey, until there is quite a wad of it, and then, with a very pretty sleight-of-hand, he carries this little cake, scarcely so large as the head of a small pin, between the middle and fore leg, back to the pollen basket. When in place, it is firmly pressed into the basket, and then neatly patted down, with the middle leg, much as

Fig. 1

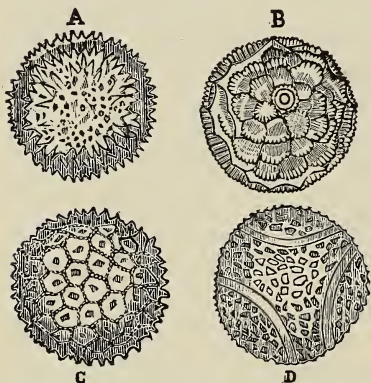
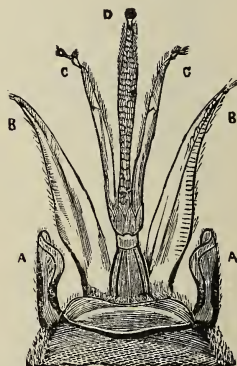


Fig. 3



Fig. 2



HOW THE BEE GETS THE POLLEN FROM THE FLOWERS.

You are to bear in mind that a bee has 6 legs; the first two legs have the mechanical contrivance just described; the last two, the pollen baskets. They are called baskets, but I never could see much resemblance to a basket, as they consist merely of a flat place, or slight cavity, A, on the side of the leg, and a few short, stiff hairs to hold the pollen from tumbling off. The engraving will give you a good idea of it. Observe the pollen is carried in the upper joint of the leg.



POLLEN BASKET.

a dextrous butter-woman gives her neat rolls the finishing taps. This motion seems to be a sort of automatic movement; for the bee is the while intently engaged, with tongue and forefeet, in gathering more pollen from the flowers. The operation may be witnessed easily, by taking on your finger a bee that is gathering propolis from some old quilt or hive. As he picks and pulls off bits of wax with his mandibles, he will convey them back to the pollen basket, much more leisurely while he stands still, and you can easily follow the whole proceeding. Even on a cool day, when his motions are sluggish, you will be astonished at the wonderful

celerity and swiftness with which these funny little legs move. When he has a load that he deems sufficient, he spreads his wings and soars aloft; but, if the field is a new one, he will circle about and take his points, returning again and again, that he may not mistake where to come back, his plump little load being plainly visible while he is on the wing.

When he gets into the hive, if a young bee, he has to go through with a series of rejoicings—see BEES; but if a regular laborer, he proceeds at once, or at least as soon as he has had a breathing spell (for carrying large loads of pollen is like carrying a hod of brick to the top of a three story brick building), to deposit the pollen in the cells. This is done very quickly, by crossing his pollen legs while they are thrust to the bottom of the cell, and then kicking the loads off, very like the way in which our blue-eyed baby kicks off her shoes, when she takes a notion to go barefooted. After the load is off, he starts out again, without paying any further attention to the matter. The question keeps coming up to me, does the bee that brings the pollen never stop to pack it in the cells or eliminate it for the young larvæ? I am convinced that he usually does not, but where the hive is deprived of young bees, I think almost any bee can do this work. If there are plenty of young bees in the hive, he probably concludes he has nothing further to do with it.

After the pollen is dropped in the cells, it will fall out if the comb is turned over, and when the maples are first out in the spring, I have heard and seen the pollen rattle out like shot, in turning the combs horizontally to look at the queens. Very soon after the pollen is thus deposited, the nursing bees come and mash it down into a hard cake; I have not been able to discover how they do this, unless it is done with the head. The *British Bee Journal* for May, 1876, graphically describes the whole operation as follows:

The pollen-laden bee, upon entering the hive, makes directly for the brood-nest, and where its load is required, it quickly disencumbers itself. Sometimes the nurse-bees are in want of the all-necessary pollen, and nibble it from the legs of the worker without ceremony; but more often the bee goes to a cell devoted to pollen-storing, and hangs by its first pair of legs to another cell immediately above, and by the aid of its middle pair of legs it unloads its hindmost, and (as it were) kicks the balls of pollen into the proper receptacle. Here they are mixed with a little honey and kneaded into a stiff paste, which is then rammed hard against the bottom of the cell, for future use, the bee using its head as a battering ram; these operations are re-

peated until the cell is almost filled with the kneaded dough, when a little clear honey is placed on the top, and it is sealed over and preserved as bee-bread. If a cell full of pollen be cut in two, longitudinally, its contents will, as a rule, be found of many colors, stratified, the strata of varied thickness standing on edge, as if the bees, instead of storing bread, had stored pancakes.

The principal supply of pollen in our locality is from maple in the spring, and from corn in the latter part of summer and fall. Almost all flowers that yield honey, yield pollen also, to a greater or less extent, and when the bee comes in laden with the one, he almost always has some of the other.⁵⁵ The red clover yields a peculiar dark green pollen, that pretty surely indicates when the bees are gathering honey from it. They often get a considerable load of honey, with but a very small one of pollen; but, if you did not notice very carefully, you would quite likely declare that they had gathered no honey at all.

The pollen from corn is generally gathered early in the morning; when it is first coming into bloom, I have seen them start out in the forepart of the day, much as they do for a buckwheat field.

For further information in regard to the offices of pollen in the hive, see BEES.

NECESSITY OF POLLEN FOR BROOD REARING.

We are interested about pollen, because bees can not-rear brood without either it, or some substitute for it. Bees kept in confinement, and fed on pure sugar and pure water, will thrive and void little or no excrement; but as soon as pollen, or food containing the farinaceous element, is given them, their bodies will become distended, and instead of a transparent fluid, they will void a fluid of a darkish tint, which will soil their hives, and emit quite an unpleasant smell. I once kept about 300 bees in a cage with a queen, and gave them only pure sugar and water. They built comb, and seemed quite contented, the cage emitting no smell at all. In order to start brood rearing, I gave them some sugar candy containing flour, and they got uneasy very soon, and tried in vain to get out. At this time, the cage gave off quite an unpleasant smell, and so they were allowed to fly; had the pollen element not been given them, I presume they would have stood the confinement for a month or more. I once wintered a fair colony of bees, on stores of pure sugar syrup, and when they flew in the spring there was no perceptible spot on the white snow about their hives. They had no

pollen, and, of course, no brood rearing could go on without it. A few years ago, I made some experiments with bees confined in a large room under glass. As it was late in the fall, after brood rearing had ceased, I did not know whether I should succeed in starting them again. After feeding them for about a week, eggs were found in the cells, but none of them hatched into larvæ. A heap of rye meal was placed in the center of the room near the feed, and anxiously I waited to see them take notice of it. After several days, a bee was seen hovering curiously about it. In breathless suspense, I watched him, until he finally began to dip his tongue into the heap, and then to pad it on his legs. He carried home a small load. I had the hive open, and the frame out, as soon as he was among his comrades, and watched the behavior of the rest while he shook himself among them, until he deposited his treasure in a cell, and hurried away for another load. Very shortly, some of the rest followed him, and buzzed about the room, until they found where he was loading up, and soon they were at work on the meal, as merrily as in the spring. Of course, the eggs were very soon, now, transformed into unsealed larvæ, then into capped brood, and, in due time, I had young bees hatched out in the month of Dec.

By warming the room with a stove for several days in succession, I found I could start brood rearing and pollen gathering even in the month of January. It may be well to state here that, although I succeeded in rearing bees in midwinter, as strong and healthy, apparently, as those raised in summer time, the experiment was hardly a success after all; for about as many bees died from what I suppose was the effect of confinement, as were hatched out. It was a decided success, in determining many unknown points in regard to bees, aside from the office of pollen, and I presume, if it ever should be necessary, we could overcome the difficulties of flying bees under glass.

ARTIFICIAL SUBSTITUTES FOR POLLEN.

It has been known for many years that, in the spring time, bees will make use of the flour or meal of many kinds of grain, and many bee-keepers feed bushels of it, every season. The favorite grain seems to be rye; and, as the bees are apt to fall into it and sometimes get so covered as to perish, I have been in the habit of having the rye ground up with an equal quantity of oats. A great many plans have been devised for feeding it without waste; but, after all our experi-

ments, a heap of meal on the ground seems about as satisfactory as any way. Of course, it should be protected from rain, and as there is usually much high wind in the spring, which is, to say the least, very annoying to the bees, it is well to have it in a spot sheltered as much as possible, always aiming to give them as much sunshine as may be. By way of experiment, I have concentrated the rays of the sun on the meal heap, by mirrors, that the bees might work on days otherwise too cold; I have also made glass-covered structures for the purpose; and have even kept their meal hot by means of a lamp nursery; all these plans have succeeded, but I am inclined to doubt whether stocks pushed along, in brood rearing, by such means, were really in advance of some that were left to take their chances. It is amusing to see the little fellows start from their hives on days so cold that they would not otherwise stir out, hie to the warm meal and load up, and then go home so quickly that they do not have time to get chilled.

Is there any danger of feeding them too much meal? In our own apiary, I have never known them to take so much that it was not used at once for brood rearing; but I purchased of a neighbor some hives which contained flour in the cells, dried down so hard as to make it necessary for the bees to cut it out, comb and all, as the only means of getting rid of it. I presume this came about by the sudden appearance of natural pollen, when they had laid in a pretty good supply of the flour; it is well known, that as soon as the natural pollen can be obtained, they at once abandon all artificial substitutes. I think there is but little danger of giving them too much rye and oat meal, but I would not risk giving them great quantities of fine wheat flour.

Not a few of our readers have been perplexed and astonished, doubtless, by seeing the bees in early spring, greedily appropriating sawdust, just as they do rye meal. I have seen them at the sawmills, so thick on a large heap of fresh sawdust as to attract a large crowd of people, and when I caught them, and tasted of the pollen from their legs, I was somewhat amazed to find it sweet and very much like the pollen from the flowers. I presume they had plenty of honey but no pollen, and that these fine particles of wood contained enough of the nitrogenous element to answer very well, mixed with honey, as they have it, when packed in their pollen baskets. The pollen from green tim-

ber contains an essential oil, besides some gummy matter, that gives an odor doubtless reminding the bees of the aroma of the opening buds. Not only do they thus collect the, to us, tasteless sawdust, but they have been found at different times on a great variety of substances. A friend in Michigan, at one time found them loading up with the fine black earth of the swamps, and they have been known to use even coal dust; but the strangest thing of all was told me by the owner of a cheese factory near by. He said the bees were one day observed hovering over the shelves in the cheese room, and as their numbers increased, they were found to be packing on their legs, the fine dust that had accumulated from handling so much cheese. Microscopic investigation showed this dust to be embryo cheese mites, so that the bees had really been using animal food as pollen, and living animals at that. If one might be allowed to theorize in the matter, it would seem this should be a rare substance to crowd brood rearing to its uttermost limit. As cheese can now be bought here for 6 or 8c. by the quantity, it might not be so very expensive for bee food after all.

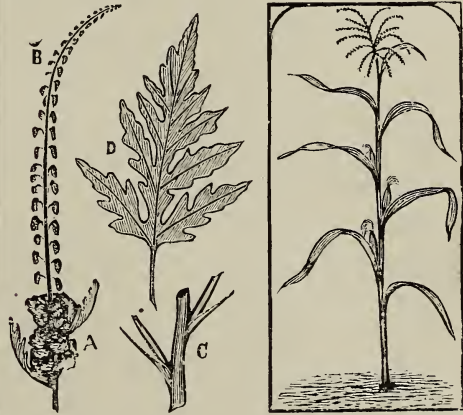
Bees can be taught to use a great variety of articles of food in this way, when they are in need of pollen, and therefore the story of giving a hive of bees a roasted chicken, to promote their comfort and welfare, may be not entirely a myth. Ground malt, such as is used in making beer, has been very highly recommended in place of rye meal, but as I have never succeeded in getting any of it, I cannot speak from practical experience.

THE AGENCY OF THE BEES IN FERTILIZING PLANTS, BY MINGLING THE POLLEN.

This is too wide a subject to be discussed at full length here, but I will give you a few examples, to start you on the track. A perfect blossom contains both stamens and pistils, the male and female organs of reproduction; but sometimes we find flowers having stamens only, and others having pistils only; and these two blossoms may be borne by the same plant or by different plants.

If I am correct, the plant is fertilized by the pollen from the stamens falling on the stigma at the summit of the pistil. Unless this is done, the plant ripens no seed. Nature has adopted a multitude of devices for carrying this pollen from one blossom to the other, but perhaps the most general, and the one with which we have to do principally, is the agency of the bees. Common corn is an illustration of a class of plants that bear

both kinds of blossoms on the same stalk. The blossom that bears the seed is low down, and is what we commonly term the silk of the ear. The one that bears the pollen is at the very summit of the stalk, and the pollen, when ripe, is shaken off and falls on the silk below; or what is still better, it is wafted by the wind to the silk of the neighboring stalks, thus preventing in and in breeding, in a manner strikingly analogous to the way in which the drones fly out in the air, that the chances may be greatly in favor of their meeting queens other than those from their own hives. You may object that the silk from the ear of corn is not properly a flower, so I will give you a more striking instance. The common rag weed, *Ambrosia artemisiæfolia*, also sometimes called bitter weed, or hog weed, bears two distinct, and entirely unlike flowers.



RAG-WEED AND CORN, SHOWING THE TWO KINDS OF BLOSSOMS ON ONE STALK.

On the ends of the tall racemes, as at B, the pollen bearing blossoms are seen very conspicuously, and many of you who are familiar with the weed, perhaps never imagined that it had any other blossom at all; if so, will you please go out doors and take a look at them again. Right close to the main stem, where the branches all start out, you will find a very pretty little flower, only that it possesses no color except green, and it is here where all the seeds are borne, as you will see on some of the branches where they are matured. Now, if you will get up early in the morning, you will find that these plants when shaken, give off a little cloud of fine green dust, and this is the pollen of the plant. Before I knew what it was, I used to find it annoying on account of the way in which it soiled light clothing. As this plant is in no way dependent on the bees for the fertilization of its blossoms, they con-

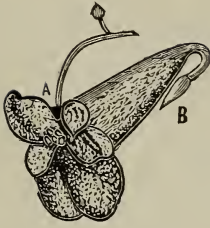
tain no honey, or at least I have never been able to detect any; although I have, during two seasons, seen the bees quite busily engaged gathering the pollen. It is said that corn sometimes bears honey, as well as pollen, although I have never been able to get proof of it. These two plants, as I have before remarked, seem to insure crossing the seed with other plants of the same variety, by bearing the pollen-bearing flowers aloft, on slender spines; also by furnishing a great preponderance in numbers, of these blossoms, for precisely the same reason that a thousand or more drones are reared to one queen. A stalk that succeeds in pushing itself above the others, and in bearing a profusion of pollen flowers, will probably be the father, so to speak, of a multitude of the rising generation, and this process, repeated for generations, would develop just the tendency of corn and ragweed, to shoot up tall spires, clothed with an exuberance of the pollen bearing blossoms. As the plants that give the greatest distance on the stalk between the lower, or seed blossoms, and the upper ones, are most likely to shed the pollen on neighboring plants, this, too, fosters the tendency mentioned.

But what shall the great multitude of plants do, that have no tall spines with which to shake their pollen to the breezes? Here is where the bees come in, and fulfil their allotted task, in the work of animal and vegetable life. They would, it is true, visit many plants for the pollen alone, but with by far the greater part of them, the pollen is only a secondary consideration, or not sought for at all; in vieing with each other, or, in the strife to perpetuate their species, what shall the plant do to offer the greatest attraction to the bees, to visit them, and carry the precious pollen to the neighboring blossoms, for the purpose we have mentioned? Suppose we wish to gather a group of school children about us, what will be the surest and most effectual method of doing it? Coax them with candy, maple sugar, and the like, of course; and that is just what the plant does; or it does still more, for it ransacks its storehouse and, I dare say, sends its roots abroad through the soil, with untiring efforts, to steal a more delicious and enticing nectar, more wonderfully exquisite than even the purest and most transparent maple sugar syrup ever distilled, or "boiled down," by the skill of man, for the sole purpose of coaxing the bees to come and dust themselves in their precious pollen, or to bring from some other blossom, the pol-

len they have previously been dusted with. Now, this honey is precious, and it must tax the plant to its utmost to produce it; nature, therefore, who is a most careful economist, not only deals it out in small doses, but she places it in the most cunning nooks and corners, that the bee may be obliged to twist himself into all possible shapes, around and among the stamens, until the pollen is most surely dusted all over him. Observe, that the flower secretes no honey until the pollen is ripe, and ready to do its work; that the honey slowly exudes into the nectaries, that the bees may be kept coming and licking it out every hour in the day; and that the flow of honey ceases, just as soon as the pollen is ripened and gone. A lady has suggested a beautiful experiment, to determine the amount of honey yielded by the spider flower, *Cleome*; she tied lace over the stalk, to keep away the bees that were constantly visiting it. The honey collected in quite a large drop. I presume we could measure the amount with many other plants in a similar way. The little cups on the flower of the *FIGWORT*, I have seen full to the brim, with honey, when found standing alone out in the woods. Truly:

"Full many a flower is born to blush unseen,
And waste its sweetness on the desert air."

Did you ever remark the spot of fur or down on the back of the bee, just between the wings? Well, bee hunters sometimes put a small drop of white paint on this spot, that they may know a bee when he comes back. Several years ago bees were going into many of the hives, with a spot of white on this fur that looked, at first sight, almost like white paint. For several seasons in succession, I hunted in vain, to see where they got this white spot. At one time it seemed to come from working on thistles; but I was obliged to give this up, for I found it most on the bees, one season when they did not notice thistles at all. One swarm, of beautiful Italians had filled their hive nicely, in Sept., and almost every bee had a white back. I lined them from the hive, and followed them. They went toward a large piece of wild woodland, and I scanned the tops of the trees in vain; finally, over between the hills, beside a brook, I found acres of the wild touch-me-not (*Impatiens*), the same plant that we have often played with in childhood, because the queer little seed pods will snap all to pieces when ripe, if they are touched ever so carefully. The honey is secreted in the spur to the flower, shown next page at B.



FLOWER OF THE WILD TOUCH-ME-NOT,
SHOWING THE WAY THE BEE GETS
THE POLLEN ON HIS BACK.

The bee can only reach this by diving down into it almost out of sight; and when the coveted treasure is obtained he backs out with a ludicrous kicking and sprawling of his legs, and in so doing the down on his back is ruffled up the wrong way. Now this would be pretty certain to get the pollen dusted all over him, but nature to make sure has planted a little tuft that bears the pollen just on the upper side of the entrance to the flower, at A, and in his struggles to get out the white pollen is brushed all over his back most effectually, to be carried to the next flower, and so on.

A year or two after this, I took a friend of mine to the spot to show him my wonderful discovery; but lo! and behold! the sharp witted Italians had taken a short cut to the honey, by biting through the spur, and inserting their tongues without the laborious operation of crowding down into the flower. I really cannot say how many years it will take the plant to discover that it is secreting the honey in that little spur in vain, or whether it will, for self preservation, make the spur so thick and hard that the bees cannot bite through it, or put the honey some where else, or do some other way. It seems very certain, that it must soon become extinct, unless something is done; for not a seed can mature so long as the bees bite through, instead of pushing past the pollen as they have formerly done.

But will there really be no seed, unless the bees visit the blossoms? I will give you some well known facts, and leave you to judge.

Common red clover was, a few years ago, introduced to Australia, and it made a most excellent growth, in that warm rich soil, but not a bit of seed could they raise. After trying in vain, it was suggested that bumble bees were required to fertilize the blossoms. Some nests were accordingly shipped from the New England states, and the result was perfectly satisfactory; for seed was raised then, without trouble. I

presume a few colonies of Italian bees would have answered equally well, but as bad luck has attended their efforts at importing, I do not know that the experiment of substituting Italians for the bumble bees has yet been tried. Darwin noticed, long ago, that bumble bees were necessary for a good crop of clover seed, and suggested the following reason why better clover seed could be raised in the vicinity of towns than elsewhere. The greatest enemy of the bumble bee, is the field mouse, that preys upon their nests; therefore, if the mice are kept at bay, the bumble bees will flourish. In the vicinity of towns more cats are kept than in the country, for every family, generally, keeps a cat, and some fearless individual has gone so far as to suggest that a town which contains an unusual number of maiden ladies, who are said to favor cats especially, will prove the most profitable neighborhood for raising clover seed.

A few years ago, the people in some part of Mass. got an idea that the bees, which were kept there in large numbers, were in some way prejudicial to the fruit; after some controversy, the bees were banished from the town. In a year or two, they found the fruit not only no better, but decidedly the reverse: for the trees blossomed profusely but bore no crops. By a unanimous request, our friend was persuaded to return with his bees, and since then the trees have not only blossomed, but have borne fruit in profusion. It is well known to those who raise the earliest cherries, that unless the sun comes out, when they are in bloom, long enough to allow the bees to visit the blossoms, no fruit will be produced. As the very earliest varieties blossom before the weather has really got settled and warm, this is one great drawback to their culture.

The Catawba is a very desirable variety of grape, as is also the Delaware; but the former is very late, and the latter very small. Dr. Grant originated the Iona, by fertilizing the blossoms of the one, with the pollen of the other; but, in his first attempts, he failed repeatedly, because the bees were sure to upset all his experiments by their intermeddling.⁵⁶ When he thought of the idea of covering the flowers from which he wished to produce the hybrid seed with lace, or something of a similar nature, to keep the bees away, he succeeded at once; and we now have the Iona, as the result, a grape that is just about half way between the Delaware and Catawba, having very distinctly the flavor of each.

Throughout the animal and vegetable kingdom, there seems to be a constant struggle for the perpetuation of their species, which is secured only by ripening perfect seeds. Notice how the weeds in our garden will struggle and fight, as it were, to get a foot hold, until they can get a crop of seeds ripened, and then remark the numerous ways they adopt, to scatter this seed as widely as possible. If the plants were animated beings, we might almost call it tricks and sharp practice; some of the seeds have wings and fly like a grasshopper; others have hooks and catch on our clothing, and on the fur of domestic animals, in the hope of being carried to some spot where they may have a more favorable place to germinate. Fruits and berries, instead of clothing themselves in the sober green of the foliage surrounding them, when the seeds are fully ripened, affect scarlet red and other bright colors, and sometimes, fancy stripes, just to induce the birds to take them in preference to the fruit of other trees. Why do they want their fruits to be eaten by the birds, if it is their purpose to secure a place for their seed? Well, if you examine, you will find that the seed is encased in a horny shell that is proof against the digestive organs of the bird, and these seeds and stones are therefore voided frequently, if not invariably, while on the wing, in just the condition to take root in the soil wherever they may be cast. Bear this in mind while we go back a little to the bees and flowers again.

I have suggested that the honey is placed in the flowers to attract the bees; after a bee has found honey in one flower, he will be very likely to examine others of a similar kind or appearance. If the flowers were all green like the leaves of the plant, the insects would find much more trouble in hunting them up, than they now do, because the contrasting color, such as the white or red of the clovers, makes them conspicuous. If you look back to what I said about corn and rag weed, you will see that the flowers of both are a plain green, for they have no need of bees to insure their fertilization.

It is easily proven that bees have a sort of telescopic vision that enables them to perceive objects at long distances; when a bee starts out in the morning, he circles up aloft, then takes a view, and starts out for business. If one field of clover should be more conspicuous than the rest, he would probably give it the preference, at least, so far as to make an examination. If he has

been at work on a profitable field the day before, he will, without doubt, strike for it without any preamble. That bees look for honey and hunt it out, I have proven to my full satisfaction; and I am well convinced that what is often called instinct, and allowed to drop there, is only profiting by experience and an excellent memory of past events, much in the same way human beings do. We say that bees instinctively go to the flowers for honey; I have watched them in the spring when the blossoms first open, and many of them, very likely the young bees that have never before seen a blossom, will examine the leaves, branches, and even rough wood, of the trunk of the tree, intently smelling and sniffing at every part, until he finds just where the coveted treasure is located. After he has dived deep into one blossom, and tasted the nectar, he knows pretty well where to look next.

One afternoon the door of the honey house was left open, and the bees were doing a "land office" business, before the mischief was stopped. After closing the door until they had clustered on the windows in the room, it was opened, and the process repeated until all were out; but, all the rest of the afternoon, they were hovering about the door. Toward night they gradually disappeared, and when I went down about sundown to try a new feeder, not a bee was near the door. I put the feeder in front of a hive where the bees were clustered out, and as soon as a few bees had got a taste and filled themselves, they of course went into the hive to unload. I expected a lot to come out, as soon as these entered with their precious loads, but was much astonished to see a regular stampede come tumbling out, as if they were going to swarm, and still more when they rushed right past the feeder and took wing for—where do you suppose? the honey house door, of course. How should they reason otherwise, than that it had again been left open, and that was where these incomers had found their rich loads. On finding it closed, back to the hive they came, to repeat the manœuvre over and over again.⁵⁷

HOW TO START BEES AT WORK ON RYE MEAL.

A beginner hears the feeding of oat meal highly recommended as a substitute for pollen. He places some near the entrances of the hives, but not a bee touches it. He is told again, to wait until early spring, before the bees have access to natural pollen, and then they will take it. He does so, but, as before, not a bee notices it. He is next told

to put a heap of it in the sun, a few rods distant from the hives. This time he may succeed, but it would not be strange, if he should once more report that his bees would have nothing to do with it. Finally, he is directed to take a piece of honey, and get some bees to feeding on it, then to set it on the heap of meal. The bees soon gather over it in great numbers; those who go home loaded start out many more searching all about the vicinity, to see where the treasure comes from. The hum of the busy ones on the honey soon attracts them, and in snuffing about the pile of meal, some bee discovers that it can be used as a substitute for pollen; the others soon follow suit, and, in a little time, both the bees and their owner are happy, and the pile of meal quickly disappears. After this, he never has any more trouble in getting the bees to work on meal, for he *knows how*. The bees and their owner have both learned a valuable lesson about pollen. Is there any very great difference in the way they have been taught? Did they not both learn by practical experiment?

The touch-me-not has learned by ages of experiment, to produce a bright orange flower, to secrete honey in the spur, to place the pollen bearing stamens at the point where the bee must rub against them in getting the honey, to construct those wonderful seed pods, which explode and scatter the seed far and wide, just that it may reproduce and multiply its species. I should judge it had succeeded pretty well, in a waste piece of woodland near my home, for there are now acres of it as high as one's head, and it is quite a valuable acquisition to our apiary.⁵⁵ As near as I can make out, the plant has much increased since the advent of the Italians, as might be expected; and instead of having a dearth of pasturage for several months in the fall of the year, we not only have honey enough so that the bees trouble the houses and groceries very little, but they amass sufficient stores to carry them through the winter, with little if any feeding. This is true of dandelions, as well, and the large, brilliant, showy blossoms that now line our roadsides and waste places, instead of unsightly weeds, should remind one of how much an apiary of bees contributes to fulfill the words of sacred prophecy:

The wilderness and the solitary place shall be glad for them; and the desert shall rejoice, and blossom as the rose.—*Isaiah*, 35 : 1.

Now, I can not positively affirm that the flowers were given their gaudy colors by the bees' selecting the brightest and most con-

spicuous, thereby inducing such blossoms to bear seed in preference to those less gaudily attired, neither do I know that cherries became red, because the birds selected those that showed a disposition to that color, year after year, for many centuries; nor can I prove that the bright plumage of male birds came about in the course of time, simply because the female encouraged the attentions of, and showed a preference for those most handsome. I can only suggest that the actions of birds, bees, flowers, and fruits, seem to point that way. You all know how quickly we can get fancy colored flowers, yellow queen bees, or birds of almost any shade or color, by careful selection for several generations. Have not the bees so colored the flowers, and birds, the berries, etc., although they did it all unconsciously?

My friend, before you again complain because you have found a cell or two of bread in your comb honey, would you not better ponder on the wonderful agency which those simple grains of pollen exert on the plant life that is yet to come, years perhaps, after we have faded away and gone.

POLLEN IN SECTION BOXES AND COMB HONEY.

I do not mean to convey the idea that we should be satisfied with pollen in our honey, for a very good and useful thing is sometimes a very bad one, if out of place. When pollen or meal is brought into the hive, it is taken, at once, very near to the brood; in fact, it is placed in the comb opposite, if possible. When opening hives in the spring, we find pollen scattered all through the brood combs to some extent, but the two combs next to the two outside brood combs are often a solid mass of pollen. Should a few stormy days intervene, however, this will disappear so quickly, that one who has not witnessed the rapidity with which it is used in brood rearing, would not know how to account for it. When it is gone, of course, the brood rearing must cease, although the queen may continue to lay. The amount of brood that may be reared by keeping a stock supplied with pollen artificially, during such unfavorable weather, is a very important item, where rapid increase of stock is desired.

Using the candy slabs with 1-4 or 1-5 wheat flour, is perhaps the surest way of doing this. See CANDY FOR BEES.⁵⁶

A friend has a house apiary, where the combs are pretty deep, and no upper story is used. His comb honey was all secured in frames containing sections, at the side of the

brood. When asked if the bees did not deposit pollen in the sections when used in that way, he replied, "Not if a comb is interposed between the brood and the honey." This is because they always want the pollen next the brood. Now, we can get more comb honey by having it near the brood than in any other way; what shall we do to keep out the pollen, and to keep the queen from laying eggs in our surplus honey sections? The remedy I have adopted, and advised through this work, is the use of the tin separators, with the small 1 lb. section boxes; for it is well known that the queen is averse to using small pieces of comb, or comb near much wood. In our own apiary, I have never known the queen to deposit eggs in these sections, when thus prepared, even if they are placed next the brood combs; but others have written that they are, at times, filled with both brood and pollen, even when thus prepared. If I could see the hives, I think I could find the trouble, yet there may be exceptional cases. The frames or sections used in the lower story are more likely to be filled with pollen than those in the upper story; for if the broad frames and sections are so made that but about $\frac{1}{4}$ inch space is left for the bees to go up into them, the queen is very unlikely to attempt to go up.⁵⁹ An occasional cell of pollen will sometimes be found, which I regret the more, because such combs are much more likely to contain worms, if taken out in warm weather. If it were not for this small, accidental quantity of pollen, I am not sure we would ever find worms in the comb honey. See BEE MOTH.

PORTICO FOR HIVES. Although no one has ever given a satisfactory reason for encumbering a hive with a portico, that we know of, still there are many who can not be satisfied without them. One of our neighbors says they make a comfortable shade for the bees when hanging on the outside of the hive; very likely he is right, and we do not know that we care to argue the matter with him, but we should prefer making the bees comfortable on the inside of their hive, where they might be engaged in some such pastime as building comb, &c. If the portico is to be added for ornament, we would make one that would be ornamental, and would only put it on the hives in the front yard, or those in a central or conspicuous part of the apiary, but would by no means think of encumbering the whole of them, upper stories and all, with such an unwieldy appendage. The Simplicity hive

is for real work, and occupies just the smallest amount of space possible, consistent with this end; and if we are going to make it ornamental, it should be by adding something that can be taken off whenever occasion demands. To this end I have devised the portico shown below.



PORTICO, DETACHABLE.

The top and sides are made of a strip of $\frac{3}{4}$ pine sawed nearly through and bent where the angles come, thus giving us neat joints at a small expense. The scroll work underneath, to which the above is nailed, can be sawed from a $\frac{1}{4}$ board by almost any of the scroll sawing machines, that are now in such common use. The whole is attached to the front of the hive by a couple of screws. When it is kept free from spiders' webs and nicely painted, I confess that the bees walking about their doorway underneath, present a very pretty appearance. When dust or webs accumulate, the screws may be turned partly to allow of its being taken off, and thoroughly brushed, or even washed if need be. Nothing can be considered ornamental about an apiary, that is not neat and tidy. These porticos can be well made and neatly painted, for about 25 cents. See page 108.

PROPOLIS. This is the gum or varnish that bees collect for varnishing over the inside of their hives, filling cracks and crevices, cementing loose pieces of the hive together, and for making things fast and close generally. It collects, in time, on old hives and combs, so as to add very materially to their weight. It is not generally gathered in any great quantity, until at the close of the season, and it seems to be collected in response to a kind of instinct that bids them prepare for cold weather. I wish I were able to tell you more definitely where they get it; it has been suggested that it is collected from the resinous buds of the balm of gilead, and trees of a like nature; but to tell the truth, I do not know that I ever saw bees collecting fresh propolis at all.⁶⁰ I see them almost every day, collecting propolis from old hives, old quilts, and pieces of refuse wax, when we are so wasteful and untidy as to leave any such scattered about. That the principal part of it comes from

some particular plant or class of plants, or tree, I am pretty well satisfied, for almost the same aromatic resinous flavor is noticeable, no matter what the locality, or season of the year. Bees gather propolis with their mandibles, and pack and carry it precisely as they do pollen. It is never packed in the cells however, but is applied at once to the place wanted. It is often mixed with wax, to strengthen their combs, and is applied to the cells as a varnish, for the same purpose. In the absence of a natural supply, the bees frequently resort to various substances, such as paints, varnishes, resins, pitch, and the like; and the superstition, popular in some sections, that bees follow their owner to the grave, after his death, probably obtained credence from seeing the bees at work on the varnish of the coffin. To save the bees the trouble of waxing up the crevices in their hives, it has been suggested that a mixture of melted wax and resin be poured into the hive and made to flow along the cracks and corners. This may do very well, although I fancy the bees can do this better and cheaper than we can. Our principal trouble has been to get rid of the surplus propolis, and I would much rather hear of some invention to keep it out of the way, than to add more.

It has been recently suggested that we paint our hives both inside and out, and also the frames, except where we wish to have the comb attached. From what experience I have had with painted bottom boards, I am inclined to favor the idea, for even if propolis is attached to the paint, it cleaves off much more readily than from the plain wood. By keeping the surface on any wood work on the inside of the hives well oiled, or even rubbed with tallow, we may almost entirely prevent the accumulation of propolis. Many inventors of hives, and arrangements to be used inside of hives, seem utterly oblivious of the fact, that everything, in the course of time, is not only waxed over with this gum, but all holes, cracks, and interstices, where the bee cannot crawl, are filled, and covered up with it. Many new arrangements work nicely the first season, but after a year or two more, are so clogged and fastened up, as to be utterly impracticable. It is propolis that is the great hindrance to all closed tops, or closed end frames for brood combs, to the old fashioned honey boards to all sorts of slides and hinges, or to anything else about a hive that is to move like machinery. On account of the troubles with propolis, I have

advised a plain simple box, for both the chaff and simplicity hives, and for the same reasons, principally, I prefer to use the metal cornered frames. It is all very well, to talk about keeping the propolis out of the joints and connections, but in our locality, in the fall of the year, we often have it in such quantities that it runs during a hot day, like molasses, all through every part of the hive, at times, making ones fingers stick to the utensils, so it is almost impossible to lay them down when we would. With the ordinary wood top bars to the frames, when the supporting arms are removed from the rabbets, the propolis will run down so that, when the frame is put back, it is bedded almost as nicely as if it was laid in glue. Should the weather be cool when next your hive is to be opened, the stick must be pried up with a snap, that is not at all according to the liking of our bees, the most of them, even if they are pure Italians. To obviate this, I believe the metal rabbet, or, at least, a strip of hoop iron, is now in general use; but the bees will, in time, wax a wood supporting arm pretty firmly, even to this, besides there is an almost constant liability of cutting bees in two, when the frames are put in place. I know of no way of working safely and rapidly, except with the knife edge supports which the metal corners give; yet I know a great many do not like them. In using the wood top-bars, I should always carry a small screw driver in my pocket, with which to pry things loose about the hive.

HOW TO KEEP PROPOLIS FROM SURPLUS HONEY.

Of course, the readiest means is to remove all sections just as soon as a single one is capped over; and, as but little propolis is gathered during a strong yield of honey, but little will be found on the honey, unless it is left until the yield has ceased. The bees not only cover all the wood work of the sections if left on too long, but they also varnish over the whole surface of the white capping, almost spoiling the looks and sale of the honey. We can keep it from the wood, by having every part of the sections covered, when in the hive, except the inner sides where the combs are attached. Our frames for section boxes, as described, do this effectually.

HOW TO REMOVE PROPOLIS FROM THE FINISHERS.

A variety of substances have been suggested. Alcohol is perhaps the neatest, but is rather expensive; benzine answers near-

ly as well, but has an objectionable odor; soap will answer, if a little lard be rubbed on the hands first, but will have little effect on it otherwise. A friend down South says he has a pair of light cotton gloves, which he slips on when handling the waxy frames, and his hands are left clean whenever he is obliged to stop work. For removing it from glass, etc., alcohol is perhaps best. When we have much glass soiled, it can often be cleaned most expeditiously, by boiling it in a kettle of water with a quantity of wood ashes.

DO THE BEES NEED PROPOLIS?

Much discussion has arisen in regard to the habit of the bees, of making all openings tight with propolis. Theory says, if allowed to follow his bent, or instinct, he will smother himself to death. Practice says, he does, at least at times, so prevent the escape of moisture, that his home gets damp and wet, filled with icicles, etc., so that he suffers; or at least, such is the case in the hives we have provided for him. Who is right? the bee? or the enlightened bee-keeper? Well, I think the greater part of the fault lies in the hive we have given him. The enameled cloth which I have lately been using for covering bees is as impervious to air and moisture, as the propolis he collects with so much pains and trouble. If the outside of this is allowed to get frosty, it will, most assuredly, condense the breath of the bees on the inside, and if the outside is but thinly protected from the weather, icicles will certainly form on the inside, and freeze the bees all fast in a lump. Now I would have no fear at all in having the bees wax up everything as tight as they wished,

if I could have their winter apartment made so small that they completely filled it—filled it so full, indeed, as to be crowded out at the entrance, unless in very cold weather—and have the entire outside protected with some non conductor that would enable the bees to keep the inner walls warm at all times, and I think we should have no dampness. With chaff packing and chaff cushions, I have succeeded so well, that I am perfectly willing the little fellows shall fix up just as snug for winter, as their instinct prompts them to do.

VALUE OF PROPOLIS.

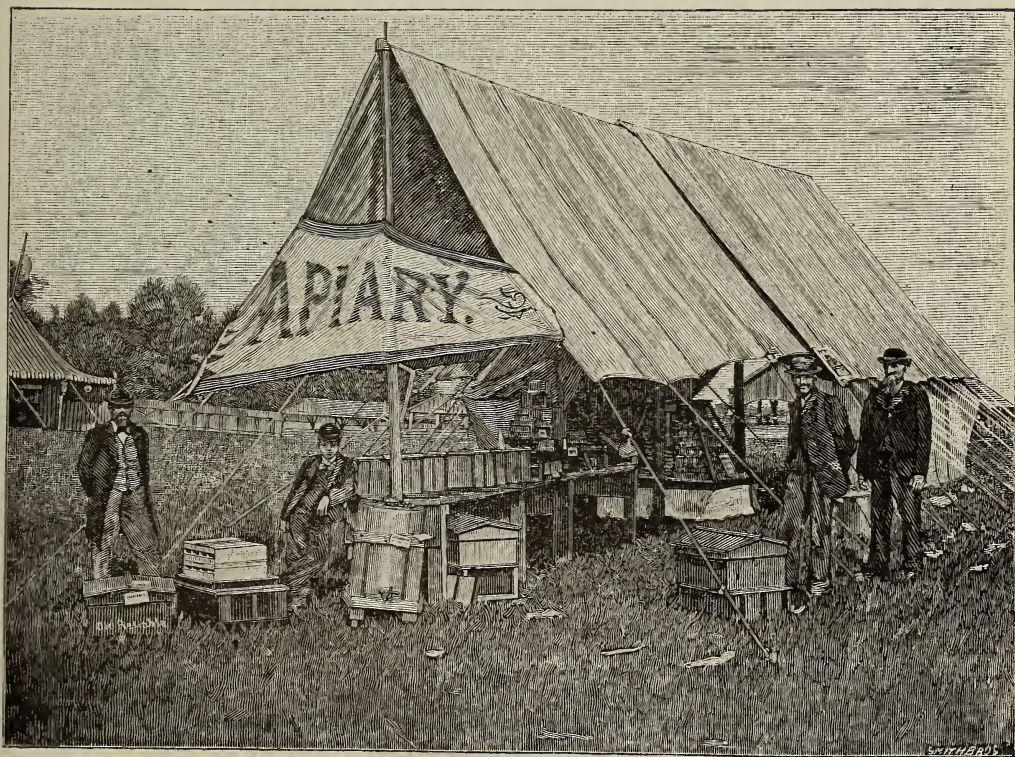
Although this gum has been used to some extent in medicine, I believe it possesses no particular value over burgundy pitch, and other cheap gum resins.

REMOVING WAX AND PROPOLIS BY STEAM.

A friend sends us the following which will prove very serviceable when one has a steam boiler convenient.

I have tried all the formulas for cleaning wax from utensils, and, in my experience, have found that concentrated lye cleans it off faster and more thoroughly than anything else. All the methods are troublesome, and it takes time to clean, especially the perforations. My plan of cleaning wax from the perforated basket of the wax extractor is, to have two pieces of gas pipe, each one foot long, just large enough to screw into the sprinkler of the fountain pump. Attach the sprinkler to one end of the pipe, procure a globe valve, and screw this on the other end, screw one end of the other piece of pipe on the globe valve, and the other end into the steam boiler, about one or two inches below the water line. Open the valve, and spray the articles covered with wax, with steam and hot water. You will be astonished to find how quickly it makes things look like new.

St. Gabrielle, La., Aug. 8, '79. J. A. PRITCHARD.



BEES AND HONEY ON THE FAIR GROUNDS.

Q.

QUEENS. The most important personage in the hive is the queen, or mother-bee. She is called the mother-bee because she is, in reality, the mother of all the bees in the hive. So much has already been said of queens, in **ARTIFICIAL SWARMING**, **DRONES**, and **QUEEN REARING**, that I presume our A B C class are already pretty well acquainted with her majesty, as she is frequently designated.

If you deprive a colony of their queen, the bees will set to work and raise another, so long as they have any worker larvæ in the hive with which to do it. This is the rule, but there are some exceptions; the exceptions are so few, however, that it is safe to assume that a queen of some kind is present in the hive, whenever they refuse to start queen cells from larvæ of a proper age.

What do I mean by a queen of some kind? Well, I shall have to tell you that bees, especially when deprived of their queens unnaturally, and broken up into small colonies or nuclei, as beginners are very apt to have them, in order to raise a queen, often select a worker larva so old that the queen raised from it is about half worker, and half queen.

IMPERFECTLY DEVELOPED QUEENS.

Such queens are small, usually dark in color, and will sometimes become fertilized, and lay eggs for a little while (all the way from a week to several months), but they are never profitable. Sometimes they will not lay at all, but will remain in a colony all through the season, neither doing any good, nor permitting any other queen to be either introduced or reared. A wingless queen, or one with bad wings, will produce the same result. The remedy is to hunt them out, and remove them. Where they are so near like a worker bee as to make it hard to distinguish them, they may often be detected by the peculiar behavior of the bees toward them. See **INTRODUCING QUEENS**.

So far as I have been able to make out, these half worker queens are the result of trying to raise a queen when there are too

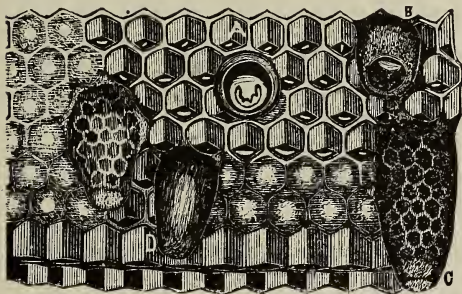
few bees, or when the larvæ with which they are obliged to rear a queen is too old; that is, too nearly ready to seal up. Where they can do no better, they will undertake to rear a queen from larva only one day before sealing up; it will be, at this age, almost full size, being 8 days from the time the egg was laid. They enlarge the cell, dose it with the royal jelly, and from that time onward, it has the care given a queen from the egg. I have watched such queens, when they first came from the cell, and some of them were little, if any, different from a common worker; others would have the body a little more elongated, and a peculiar taper, or slimness, that, to a practiced eye, invariably distinguishes the queen from the worker.

HOW A WORKER EGG IS MADE TO PRODUCE A QUEEN.

This is a question often asked, and it is one that puzzles me about as much to answer, as any question a visitor can ask. I cannot promise to tell you all about it, but I will tell you all I know about it. We will first get a frame of eggs, as we did in studying **BEEES**, but we will vary the experiment, by putting it in a colony having no queen. The minute eggs will hatch into larvæ as before, but about as soon as they begin to hatch, if you look carefully, you will see some of the cells supplied with a greater profusion of the milky food than others. Later, these cells will begin to be enlarged, and soon, at the expense of the adjoining ones. These are queen cells, and they are something like the cup of an acorn in shape, and usually occupy about the space of three ordinary cells. In the drawing given, you will see cells in different stages of growth.

At A, is a cell just being converted into a queen cell; at B, one where the thin walls are extended so as to form a queen cell proper, almost ready to seal up; at C, a cell just sealed. This occurs at just about 9 days from the time the egg was laid. In 7 days more, 16 days in all from the time the egg was laid, the queen will hatch out, a perfect

insect. Now bear in mind exactly what I say, or you will get confused. If, instead of eggs, larvæ 3 days old is given the bees, they will rear a queen, and, in this case, she will hatch in only 10 days after the larvæ was given them. These 10-day queens may be just as good as any, but to be on the safe side, I would prefer giving them larvæ one or two days younger, that they might have the benefit of this excess of food and larger cell, during the whole of their larval period. The 6-day larvæ are quite large fellows, as you will see by the cut under the head of BEES.



QUEEN CELLS.

There are some queer things about queen cells, as you will notice. After the cell is sealed, they go and put a great excess of wax on it, give it a long tapering point, and corrugate the sides something like a thimble, as shown at C. This corrugation, or roughness, when closely examined, will be seen to be honey comb on a very small scale. Now right here is a point that you will not fail to observe; bees, like other folks, sometimes make mistakes; for they do not seem to know any better than to use a drone larva for rearing a queen, if such happens to be present. Therefore, when selecting eggs for this purpose, be sure you do not give them any contained in drone comb. They will go right on, and dose the poor drone with the royal jelly, but the poor fellow usually dies before it is time to hatch out, and then the bees and their owner wait in vain for the cell to hatch. It has been reported of late, that the inmate of such a cell sometimes hatches, but he is only a drone, even then, and not a queen. Well, I am glad to be able to tell you that you never need waste time on this kind of cells, for the bees have a way of marking them, unconsciously, it would seem, too; queen cells containing

drone larvæ are always smooth, having no corrugation; so you can always detect and remove them before valuable time is wasted. We have pictured one at D.

Now, it is very handy to be able to tell about when any queen cells you may happen to find unexpectedly will be likely to hatch; and the bees are very accommodating in this respect also; for, about the day before the queen hatches, or it may be two days, they go and tear down this long peak of wax on the tip of the cell, and leave only a very thin covering, as shown at E. I do not know what this is for, unless it is because they are anxious to get a peep at their new mother. It has been said, they do it that she may be better able to pierce the capping; but sometimes, they omit the proceeding entirely, and I have not been able to see that she has any difficulty in cutting the cap off. If the cell is built on new comb, or on a sheet of fdn., and it be held up before a strong light, at about the 15th day, or a little later, you will see the queen moving about in the cell. A little later, by listening carefully, you can hear her gnawing her way out. Pretty soon the points of her sharp and powerful mandibles will be seen protruding, as she bites out a narrow line. Since she turns her body in a circle while doing this, she cuts out a circle so true, that it often looks as if cut out by a pair of compasses. Now observe that the substance of which the cell is made is tough and leathery, and therefore, before she gets clear around her circle, the piece springs out in response to her pushing, and opens just about as the lid of a coffee pot would, if a kitten should happen to be inside crowding against the lid. I have often seen them push the door open and look out, with as much apparent curiosity, as a child exhibits when it first creeps to the door on a summer morning; often, after taking this look, they will back down into their cradle, and stay some time. This is especially the case when other queens are hatching, and there is a strife as to who will be the reigning sovereign.

We shall have to go back a little, and consider this strange substance called

ROYAL JELLY.

The milky food before described, which is given to the young larvæ, and which is supposed to be a mixture of pollen and honey partially digested, is very similar, if not identical, in composition with the royal jelly. The bees are not the only examples in the animal kingdom, where the food is taken into the stomach by the parent, and after a partial digestion, is thrown up for the use of

* Once in a great while there is an exception to even this rule: it is when the bees build an unusually large queen-cell with corrugations so large and fanciful that it is really miniature honey-comb over the surface of the queen-cell. The only reason I can suggest for this is, that it is because they are out of work, and want something to do.

the offspring. Pigeons feed their young precisely in this way, until they are able to digest the food for themselves. It has been stated that bees use a coarser food for the worker larvæ, after they are a few days old, and also for the drone larvæ, during the whole of their larval state. What I mean by a coarser food is, a food not so perfectly digested; in fact, drones are said to be fed on a mixture of pollen and honey, in a state nearly natural. This may be so, but I have no means of proving it to my satisfaction. It has also been said, that the queens receive the very finest, most perfectly digested, and concentrated food, that they can prepare. This I can readily believe, for the royal jelly has a very rich taste—something between cream, quince jelly, and honey—with a slightly tart and a rank, strong, milky taste that is quite sickening, if much of it be taken. I am much inclined to think that the same food that is given the young larvæ at first, will form royal jelly, if left exposed to the air, as it is in the broad, open, queen cells. After a queen has hatched, it is sometimes found dried down hard, and looks much like stiff fruit jelly. Whether this is the product of the milky food when allowed to stand, as I have suggested, is a question to be decided. The bees when rearing queens, furnish this food in profusion, and I have seen, during the swarming time, single combs that contained a good spoonful, deposited, of course, in queen cells. Here is quite an unexplored region that I wish the A B C class would work up, and report upon.

WHAT DOES THE QUEEN DO WHILE SEALED UP?

Candidly, I do not know very much about it, although I have opened cells at every stage after they were sealed, until they were ready to hatch. One day after being sealed, they are simply an ordinary larvæ, although rather larger than worker larvæ of the same age; after two or three days, a head begins gradually to be "mapped out," if that is the proper expression, and later, some legs are seen folded up; last of all, a delicate pair of wings come from somewhere, I hardly know how. Two days before hatching, I have taken them out of the cell, and had them mature into perfect queens, by simply keeping them in a warm place. I have also taken them out of the cell before they were mature, held the white, still, corpse like form in my hand while I admired it as long as I chose, then put it back, waxed up the cell by warming a bit of wax in my fingers, and

had it hatch out three days after, as nice a queen as any. Mr. Langstroth mentions having seen the whole operation by placing a thin glass tube, open at both ends, into the cell, so as to have it enclose the queen, the bees being allowed to cap it as usual. If I am correct, this experiment was first made by Huber. With several such glass queen cells, and a lamp nursery, I presume the whole operation could be watched from beginning to end. Who will be first to do this, and give us a history of the changes?

DAVIS' TRANSPOSITION PROCESS.

In the month of August, 1874, after I had discovered how to send larvæ for queen rearing safely by mail for short distances, our friend J. L. Davis, of Delhi, Ingham Co., Mich., wrote that he should get a large number of queens from the piece I sent him, for he was going to remove the larvæ from the cells and place them in queen cells already started in his hives; of course, removing the original larvæ first. I caught at the idea at once, and went to some hives of hybrids that had persisted in tearing down all the cells given them, and building others from their own brood, and removed the larvæ from all the cells, substituting larvæ from the imported queen in its stead. I used a quill toothpick, for making the transposition. Almost every cell was built out and capped, just as well as if they had kept their own black stock. In due time, I had as nice a lot of fine yellow queens as I ever reared. We have practiced this method, almost every year since.

Mr. Davis described his invention in the Sept. No. of GLEANINGS, for 1874, and it has been commented on and suggestions added, in almost every volume since. From letters received from other parties, it seems that he may not have been the first person to make the discovery that larvæ could be thus safely transposed, but as he was the first one who made the discovery known to the public, and put it into practical and profitable use, he certainly deserves all credit and honor for his discovery, and a vote of thanks for generously giving it to the world at once, without any thought of reserving it for his own private benefit, as he might have done.

During the past season we have used a tiny silver spoon, made on purpose for removing the larvæ, and as much of the milky food along with it as is possible. I need hardly caution you that these small larvæ are very tender and delicate, and will hardly bear so much as a touch, without injury.

WHAT BECOMES OF THE QUEEN AFTER SHE GETS OUT OF THE CELL?

I am glad to say, that I can tell you, by personal observation, pretty nearly what a queen does, after she pushes open that hinged door that I told you of, and which you will find illustrated under the head of QUEEN REARING. She generally begins to put her head into the cells until she finds one containing unsealed honey, from which she takes a sup that, at least, indicates that she likes that kind of provision. May I digress enough here to ask, if it does not almost seem proper to say that she *remembers* where honey is to be had? *She* never existed before, it is true, but are you sure she does not remember at all what her mother and grandmother did ages and ages before her? It may be as well to say she does it by instinct, but I confess that term hardly satisfies me.

After she has had her supper, she begins to crawl about, partly to enjoy using the long strong legs God has given her, and perhaps, because she "remembers" that it is her allotted task to tear down the remaining queen cells, if such there are. If other queens have hatched before her, it is one of her first and foremost duties to look them up, and either reign supreme or die in the attempt. If all the other cells have been removed, as they usually are where queens are wanted for other purposes, she has nothing to do, but to promenade over the premises, monarch of all she surveys. If she ever sits down to take a rest, or takes a rest in any other position, during the first week of her life, I have never been able to discover it. She is always traveling about, and this is one reason why I am averse to caging young queens, in order that we may allow several to hatch in the same hive. It seems to be natural for them to run about, and I believe it is necessary for their well being. Several years ago, I thought I had made a brilliant discovery, when I succeeded in hatching all the queen cells in the hive, under cups made of wire cloth. The first hatched was allowed to run, until she became fertile, and began laying; she was then removed, and the next released, and so on. I think I succeeded in getting four laying queens from the single lot of cells, all in the one hive, but the bees made such desperate efforts to get the obnoxious cages out of the way, and the inmates of the cages to get out, that I gave up the plan, after seeing several fine queens die of nothing else, so far as I could see, but confinement.

But suppose she does find another cell; what then? Well, she sometimes runs around it awhile; sometimes, the bees tear it down, and sometimes she tears it down herself, with the same strong mandibles that she used to cut her way out of the cell, at first. She usually makes the opening in the side of the cell, as shown in the accompanying cut.



QUEEN CELL TORN OPEN.

Now, it is said that the queen immediately stings her helpless immature sister, to make a sure thing of her destruction; but of this I am not certain, for I never saw her in the act of so doing. I have seen spots in the side of the queen, that looked much as if she had been stung, but I have also rescued cells and put them in the lamp nursery after they had been torn open, and had them mature into nice queens. As these immature queens are very soft, the workers will soon pick them out of the cell, piece by piece, and I have sometimes placed them in the lamp nursery and had them mature, minus a wing or leg, or whatever portion the mischievous worker had pulled away. I judge from many such observations that the queen generally tears a hole in the cell, or bites into it in such a way that the workers take hold of it, and tear it all down, much in the way they do any mutilated or broken piece of comb.⁶¹ When queen cells have been cut out, all the larvæ that is in any way injured is at once thrown out, and none but the perfect cells preserved. Bees never fuss with cripples, or in trying to nurse up a bee that is wounded or maimed. They have just the same feeling for their fellows that a locomotive might be expected to have for a man whom it had run over. They battle against anything that threatens the extinction of the colony, it is true, but I have never been able to discover any signs of their caring for one of their number, or even having compassion on their helpless brood, when it is wounded and suffering. If a hole is made in a queen cell, by the queen or anybody else, they are very likely to tear it down and throw it away. When a queen hatches, the remaining cells are very soon torn down, as

a general thing, but there are many exceptions. When two queens hatch out at about the same time, they also generally proceed to kill each other; but I have never heard of both being killed. This probably results from the fact that they can only sting their rivals in one certain way, and the one that by strength or accident, gets the lucky position in the combat, is sure to come off victor. This explains how a very inferior virgin queen, that has got into the hive by accident, may sometimes supplant an old laying queen. Two queens, when thus thrown together, generally fight very soon, but this is not always the case. Several cases are on record where they have lived in peace and harmony for months, even when hatched at about the same time, and it is quite common to find a young queen helping her mother, in the egg laying duties of the hive, especially, when the mother is two or three years old. If the season is good, and the hive populous, very often, instead of a fight, they divide up their forces in some way, and we have AFTER-SWARMING, which see.

Sometimes the queen will pay no attention to the remaining cells, but will let them hatch out, and then their "little differences" are adjusted afterward, either by swarming, or by the usual "hand to hand" conflict "until death." I once looked for a queen, and not finding her, concluded she was lost. Another cell was inserted, and in due time hatched out. I was much surprised to find my new queen laying when only one day old, but a little further looking revealed the two, both on the same comb. Many losses in introducing queens have resulted from two queens being in the hive, the owner being sure his hive was queenless, because he had removed one.

QUEENS' VOICES.

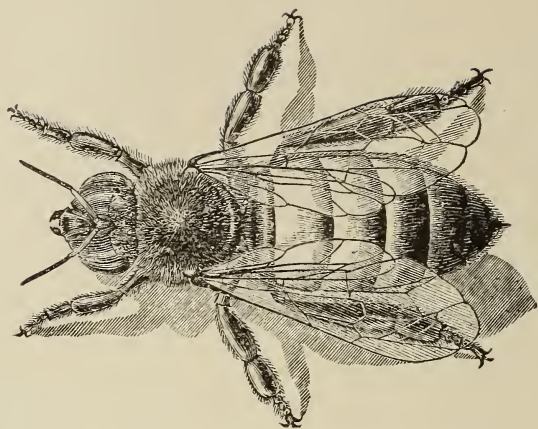
When a colony swarms naturally, the young queens of the after swarms have a queer way of calling to each other, when about to hatch out, I suppose, or when they have their cell doors open, and are afraid to emerge.⁶² The note they utter is more like "zeep, zeep, zeep," than anything else I can spell, and their tones are so different that it is really amusing to hear them call. It is common to hear them where there are two queens in the same hive, in a fighting mood, or stirred by jealousy; and I often hear this call when simply passing by the hives in swarming season. The queen sometimes utters this call at other times, though not often. When a young queen is being introduced she will frequently utter a similar

note of alarm, and some of our friends have called it "squealing." The bees are almost always stirred by these notes of the queen, and they will often turn and run after her and cling around her like a ball, when they would have paid no attention to her had she not uttered this well known note. After you have once heard it, you will recognize it ever afterward. Queens, when placed near together in cages, will often call and answer each other, in tones that we have supposed might be challenges to mortal combat.

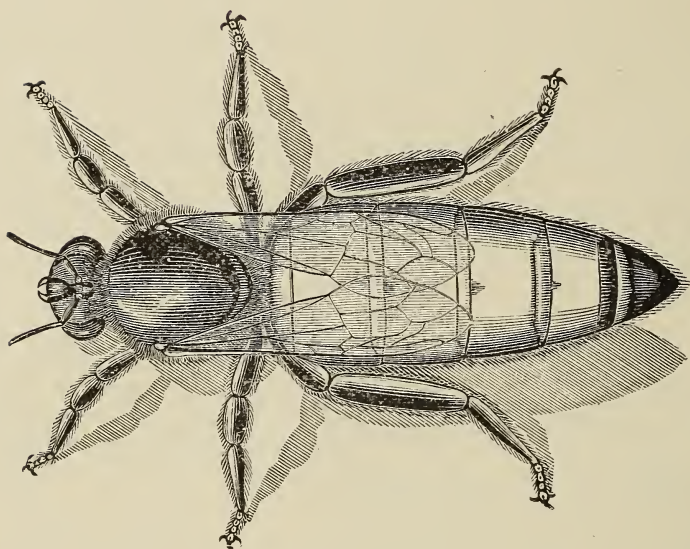
Some queens received this summer, from W. P. Henderson, of Murfreesboro, Tenn., called so loudly when placed on our table, that they could be heard clear across a long room. One voice would be on a high shrill key, and another, a deep bass, while others were intermediate. On watching closely a tremulous movement of the wings was noticed, while the queen was uttering the note, from which I infer that the sound is produced by the wings, in a manner similar to that in which katydids and locusts produce their peculiar notes. The fact that a queen may be prevented from "squealing" while being introduced, by daubing her wings with honey, is also conclusive that the sound is produced by the wings. That these sounds from the queen have the power of controlling certain movements of the bees, I am well aware, but I do not know just how or to what extent this influence works.

VIRGIN QUEENS.

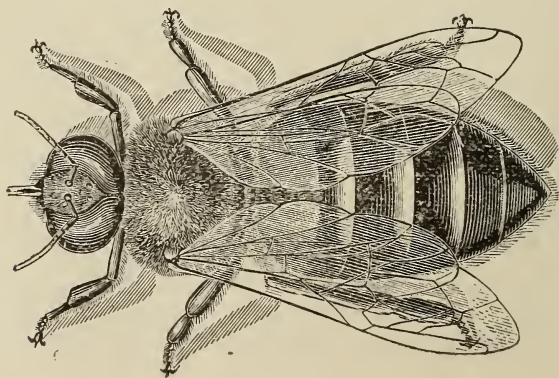
The newly hatched queen is termed a virgin queen to distinguish her from queens that have been fertilized by the drone and are laying. Virgin queens, when first hatched, are sometimes nearly as large as a fertile queen, but they gradually decrease in size, and when three or four days old they often look so small and insignificant, that a novice is disgusted with their appearance, and if he is hasty, pronounces them good for nothing. For the first week of their lives, they crawl about much as an ordinary young worker does, and it is often very difficult, if not almost impossible to find them, unless an amount of time is taken, that is more than a busy apiarist can well afford to spare. In QUEEN REARING, I have advised not to look for them, but to insert a small piece of comb containing larvæ, and if no cells are started, to decide that the queen is present, without looking. This piece of larvæ answers a three-fold purpose. It tells at a glance, whether the queen is in the hive all right or not, for the very moment she is



WORKER.



QUEEN.



DRONE.

lost, they will start more queen cells on it; it enables the bees to start another queen, in case the queen is lost by any accident in her wedding flight, which is frequently the case, and lastly, it serves as a sort of nucleus to hold the bees together, and to keep them from going out with the queen on her wedding trip, which they are much disposed to do, if in a small nucleus, containing no brood. Unsealed brood in a hive is a great safeguard against accidents of all sorts, and I have often started a young queen to laying, by simply giving the bees some eggs and unsealed brood. Whether it caused her to rouse up and take her wedding flight, or whether she had taken it, but was for some reason idle, I can not say; but this I know, that young queens that do not lay at two weeks of age will often commence, when eggs and larvæ are given to their colonies. It may be that the sight of eggs and larvæ suggests to them the next step in affairs, or it may induce the workers to feed them, as they do a laying queen, an unusual quantity of food.⁶³

AGE AT WHICH VIRGIN QUEENS TAKE THEIR WEDDING FLIGHT.

Our books seem to disagree considerably on this point, and I am afraid that many of the book-makers find it easier to copy from the sayings of others, than to make practical experiments. It has been variously stated, at from two to ten days; some go as far as to say that the queen goes out to meet the drones the day after leaving the cell.⁶⁴ It is quite likely that some difference arises from the fact, that queens often stay in the cell a day or two, after they are strong enough to walk about. Sometimes a queen will be found walking about the combs when she is so young as to be almost white; I have often seen beginners rejoice at their beautiful yellow queens, saying that they were yellow all over, without a bit of black on them; but when looked at again, they would be found to be as dark as the generality of queens. At other times when they come out of the cell, they will look, both in color and size, as if they might be three or four days old. The queens in our apiary generally begin to crawl about the entrance of the hive, possibly looking out now and then, when 5 or 6 days old. The next day, supposing of course we have fine weather, they will generally go out and try their wings a little. These flights are usually taken in the warmest part of the afternoon. I know of no prettier or more interesting sight to the apiarist, than the first flight of a queen. Perhaps a few hours

before, he had looked at her, and been disappointed at her small and insignificant appearance; but now, as she ventures out cautiously, on the alighting board, with her wings slightly raised, her tapering body elongated and amazingly increased in size, he looks in wonder, scarcely believing she can be the same insect. She runs this way and that, something as does a young bee, only apparently much more excited at the prospect of soaring aloft in the soft summer air. Finally she tremblingly spreads those long silky wings, and with a graceful movement that I can not remember to have seen equalled anywhere in the whole scope of animated nature, she swings from her feet, while her long body sways pendulously, as she hovers about the entrance of the hive. When I first beheld one on the wing, there was a queer feeling of having seen something similar, years ago, and I might have reasoned that I was remembering something my father or grandfather had seen, did I not know, that none of them were ever bee-keepers. Below, I have tried to give you a picture of



A VIRGIN QUEEN UPON THE WING.

A worker bee hovers about the entrance and carefully takes his points, when he tries his wings for the first time, but she, seeming to feel instinctively that she is of more value to the colony than many, many workers, with the most scrupulous exactness, notes every minute point and feature of the exterior of her abode, often alighting and taking wing again and again, to make sure she knows all about it. I remember that when I saw one, for the first time, go through with all these manœuvres, I became impatient of so much circumblocution, and if I did not say, I felt like saying,

"There! there! old lady; you certainly know where you live now; do you suppose a

fellow can stay here all the afternoon, neglecting his business, just to see you start off on your first journey in life?"

Bye and bye, she ventures to circle a little way from home, always bringing back soon, but being gone longer and longer each time. She sometimes goes back into the hive satisfied, without going out of sight at all; but, in this case, she will be sure to take a longer flight next day, or a half hour later, in the same day. During these seasons, she seems to be so intent on the idea she has in her little head, that she forgets all about surrounding things, and instead of being frightened, as usual, at your opening the hive, she will pay no attention to you; but if you lift up the comb she is on, will take her flight from that as well as from anywhere else. I have caught them in my hand at such times, without their being frightened at all, but as soon as they were allowed to go, they were off, as if nothing had happened. After she is satisfied that she will know the place she ventures out boldly, and from the fact of her circling right up in the air, we have, until lately, supposed that fertilization took place above the ken of human eyesight. This has recently been shown to be a mistake, I think. After a successful flight, she returns with the organs of the drone remaining attached to her body. See **DRONES**. This is a white substance, and is frequently so large as to be plainly seen while she is on the wing. I should think a queen is usually gone half an hour, but I have seen them return fertilized after an absence of not more than 10 or 15 minutes. This accomplished, she goes quietly into the hive. The bees are much inclined to chase after her, and they sometimes pull at the protruding substance, as if they would drag it away, but I am inclined to think it is eventually absorbed into the body of the queen. In looking at her the day after, all the trace of it you will observe, will be possibly a shriveled thread. In one day more, you will, as a general rule, find her depositing eggs. I presume the average age at which our queens are laying, is about 9 days; we generally wait 10 days from the date of hatching, and are then pretty sure of finding them ready to send off. Between the fertilization and the time the first egg is laid a remarkable change takes place. After the queen has been out and fertilized, her appearance is much the same as before. She runs and hides when the hive is opened, and looks so small and insignificant, one would not think of calling her a fertile queen. A few hours before the first egg

is laid, however, her body increases remarkably in size, and, if an Italian, becomes lighter in color, and instead of running about as before, she walks slowly and sedately, and seems to have given up all her youthful freaks, and come down to the sober business of life, in supplying the cells with eggs.

HOW OLD A QUEEN MAY BE AND STILL BECOME FERTILIZED.

As I have said before, our queens usually begin to lay when 8 or 10 days old, on the average; but, during a dearth of pasturage, or when drones are scarce, they may fail to lay until three weeks old. The longest period I have ever known to elapse between the birth of a queen and laying, when she produced worker eggs, was 25 days. I think I would destroy all queens that do not lay at the age of 20 days, if the season, flow of honey, flight of drones, etc., is all right. There is one important exception to this. Many times, queens will not lay in the fall at all, unless a flow of honey is produced either by natural or artificial means. Queens introduced in Sept. and Oct. will often not lay at all, until the ensuing spring, unless the colony is fed regularly every day, for a week or 10 days. Also young queens that are fertilized late in the season will often show no indications of being fertilized, until the colony is fed as I have indicated. A lot of young queens that I thought might be fertilized but did not lay, I once wintered over, just to try the experiment; and, although they went into winter quarters looking very small like virgin queens, they nearly all proved fine layers in the spring.

DRONE-LAYING QUEENS.

If a queen is not fertilized in two weeks from the time she is hatched, she will often commence laying without being fertilized at all. She is then what we call a drone-laying queen. Usually her eggs are not deposited in the regular order of a fertile queen, neither are there as many of them; but, by these marks, we are able only to guess that she may not be all right, and so keep her until some of the brood is capped, when the extra height of the cappings, as I have explained under **DRONES**, will tell the story. At times, however, the eggs are deposited so regularly, that we are deceived, and the queen may be sold for a fertile queen, when she is only a worthless drone layer; but we always discover it, after the brood is capped, and send our customer another queen. Such a case occurs, perhaps, once in a hundred. Whether these drone layers are just as good

to furnish supplies of drones for the apiary, as the drones reared from a fertile queen, is a point, I believe, not fully decided; but, if you care for my opinion, I should say, if the queen lays the eggs in drone comb, and the drones are large, fine, and healthy, I believe them to be just as good. I would not want to use drones reared from fertile workers, or drones reared in worker cells as those from drone laying queens sometimes are.

THE MEETING BETWEEN THE QUEEN AND DRONE.

Within the past year of 1878, many new facts have been furnished in regard to the matter. It seems that the drones soon spy out the queen as she is circling about among them, and pursue her, much in the way you have seen bumble bees chase each other about in the air. As the queen starts out, she curves her body backward in rather an unusual way, as you see by the cut of the queen upon the wing. I have long supposed that there was some especial purpose in this, and recent events seem to corroborate the idea. The meeting of the two insects takes place while they are on the wing, and as they are always seen whirling rapidly about each other, it seems rather difficult to determine, just how fertilization is accomplished, unless the bodies of both are curved considerably out of the usual position. The drone, probably, takes much the attitude of a worker bee, in the act of using his sting, the peculiar curve of the lower part of the queen's body favoring this. The act accomplished, both insects use their wings in such a way that they revolve in opposite directions, and the separation is thus effected in much the same way as a worker bee withdraws his sting, when allowed to do so at his leisure, by twisting around continuously, as if he was unscrewing it from a board. The organ of the drone is so firmly implanted in the body of the queen, that it is torn from his body, with all attachments, very like the way in which a bee loses his sting. It has been stated that the drone expires with a sudden contracting of his body, as if he was struck by lightning. I am inclined to think this a mistake, and that he sometimes crawls about a minute or more, and doubles up as he dies, as a queen or worker does. I would be glad of reports from those who have witnessed these phenomena, that I may make corrections in what I have stated, if I have got anything wrong. Nature, to make sure the drone organ is not withdrawn, has furnished a wonderful piece of mechanism, that comes into

play at just the right moment. I will try and explain it to you. Under the article DRONES, I mentioned to you that if the body of a drone is pressed in a certain way, just as he is leaving the hive, the body will sometimes burst open, in a manner something like the popping of corn, throwing out the male organ. Suppose you take the finger to a glove, and push in the tip, as if you were going to turn it inside out; well, now if you should blow forcibly in the glove, or even compress the finger when full of air, this tip would be violently thrown outward. It is supposed that the body of a drone is formed something in this way, and the extrusion of the organ is occasioned by a powerful muscular contraction of the rings composing his body, while under the influence of such strong excitement. Well, now suppose we liken the body of the queen to another glove finger, having a transverse cut across the end of it. This slit is deep enough to allow the body of the queen to open in two parts; and the opening is capable of being extended to nearly the whole size of the body of the queen. When the drone, while on the wing, succeeds in striking the point of his body partially into this opening, the sudden muscular contraction takes place, and his body is, in a measure, turned inside outward, projecting the male organ with all its attachments into the body of the queen, and perhaps liberating the seminal fluid at the same time. Now, nature has provided two queer shaped horns that project from the organ of the male, fitting the interior organ of the queen: these are seen very distinctly when the drone is pressed, as before mentioned. These horns alone would seem to be enough to prevent withdrawal, but nature, to make sure, has furnished them on their outer surfaces, with a sort of horny scales, or minute hairs, that stand something like the beard on a head of wheat; they can go forward but never backward, and therefore there is no way but for the poor drone to lose his life by having it torn out of him, in an instant. Nature has also made provision for the easy separation of these organs by placing them loosely in his body, and so that after they are thrown out by a no very great pressure, the attachments, which are only a membrane, give way readily, by the twisting process I have described.

Why is nature thus, as it would seem to us, needlessly cruel? Well, I presume there is some very good reason, even if we can not now see it. The single fertilization of

the queen must, for very good reasons, last for years, if not for the whole of her life. This being the case, it would not be strange, if such a draft on the constitution of the male were greater than he could stand, and be serviceable afterward for the purpose for which he was created. Nature, to make all things sure, seems to have found it fitting that he should expire in the act; as he has no other purpose of existence, so far as we know, is it not just as well?

It has been suggested that this act can only take place while both sexes are on the wing; that unless the body of the drone were inflated with air, as when flying, this wonderful bursting asunder of his organism, like the mature seed pods of the touch-me-not, could not well take place. I believe instances have been observed when the meeting took place where the insects were confined, yet had liberty enough so they could buzz about or whirl about each other; but, as a general thing, unless the parties have the liberty of the open air, and have perfect wings, fertilization is impossible. Where you have reason to think the wings of a queen are not absolutely perfect, you can test the matter by throwing her up in the air in front of her hive. I have done this many times with queens that did not lay when about two weeks old, and they are almost invariably found to be unable to rise easily in the air. It has been said that queens with bad wings are sometimes found producing worker brood; I have never found such a case, but the testimony from careful and reliable parties seems to indicate that it does sometimes happen. One who is inexperienced in these matters would hardly think of the many chances there are to be mistaken; it is now found to be a rather common occurrence for two queens to be in the same hive, and the worker brood credited to the queen with imperfect wings from birth, may easily belong to another. Again; the bees often attack a queen when returning from her bridal trip, and if they do not kill her, maim her, by biting off a wing, a leg, or perhaps both. If you should find a young queen with half a wing, or perhaps only a stump, producing workers, how many of you would not decide at once, that she must have been fertilized in the hive? I once had an Italian queen nearly black, that produced beautiful yellow workers. She was missed, and finally turned up in a neighboring hive, which, to my astonishment, was found to be Italians, instead of hybrids. She was found busily at work, but

possessed scarcely the vestige of a wing. Bees often mutilate the wings of queens which are being introduced, and sometimes, during a scarcity of honey, attack their own queens and mar their appearance in this way. I think before deciding, it will be well to await further facts and investigation. See ARTIFICIAL FERTILIZATION.

SHALL WE CLIP THE QUEEN'S WINGS?

At one time, I was strongly in favor of clipping the wings of all queens, just as soon as they were found laying. As they often got out in the grass during swarming time, and got lost, when they would probably have been saved if they had had their wings, I afterward concluded that I did not want the wings of my queens clipped. In selling queens, since then, very many of them have flown away while being introduced and I have begun to decide that clipping them is perhaps the less of the two evils. To prevent them from flying, it has been suggested that they be daubed with honey, which the bees will soon lick off; this did very well, until some one reported a queen that had to be re-caged. The honey dried on her body and killed her. Just now (Nov. 11th, 1878) the question is also being discussed, as to whether a laying queen ever leaves the hive for a second fertilization. The facts indicate very strongly, that imported queens, and others that have been a long time confined so that they can not lay, sometimes do this. Clipping will certainly prevent this, although it may result in the loss of the queen. I think I prefer the chance of loss, rather than that of a tested queen turning hybrid, but I dislike the idea of clipping a queen just before starting her off on a journey. To make it sure that there can be no flying, I would clip the greater part of both large wings; the small wings, being perfect, although smaller, will give her a symmetrical appearance, while cutting off both wings on one side, always makes her look ever afterward, very much like a cripple. If a queen is ever so fine, few people can see her beauty, when she has two long wings on one side and none on the other.

CLIPPING QUEENS' WINGS.

For this purpose, you want a pair of slender pointed embroidery scissors. They must be just as keen and sharp at the points, as they can be made; for it will never do to have the wing of a valuable queen double up, or catch so as to frighten her out of her little senses. With good scissors, you can lift a wing and clip it off without her hardly

knowing it; but where two are to be clipped, it may be well to adopt the plan given by one of our feminine contributors (especially, if you are nervous, and inclined to be fidgety in doing such work), as follows:

CLIPPING QUEENS' WINGS.

While it may be easy for *you* to open the Simplicity Hive, lift the right tin-cornered frame, and clip the queen before she knows you are around, I believe most of your readers, especially those who have other hives, other frames, and less steady hands, would, 99 times in 100, by some slip or jar, apprise her majesty of danger. Then, by following your advice, to close the hive and be more careful next time, I believe they would still fail 98 times in 100. At this rate of progress, how many times would 100 hives need to be opened to clip 100 queens?

After the queen has taken alarm, she can be clipped, by following her with the open scissors all about the comb, all over your lap, all up your sleeve, &c., till, in some favorable instant, you dare to close the scissors upon the coveted lace wing. But this operation is the most trying to the nerves, of any that ever I did, and I could not advise beginners to practice it. Because my queens *must* be clipped, I had to find a better way; and because I pinched and maimed my first queen, while clipping her, so that she was useless and had to be replaced, I have never *touched* another. How many queens have been injured by handling no one knows. I like to *know* that mine are *not* thus injured because absolutely untouched. I set a small wire cage over the queen on the comb; when she runs up into it (she will sooner run up into a small cage than a large one) I lift it, pick off two or three bees by the wing and put in for company, carry them into the house, and let them loose on a clean window. She can be clipped here in motion better than on the comb; but after allowing them to run awhile, guide them near each other and the bees will feed the queen, when the work can be easily done. I have since found out a more expeditious way: while the queen is passing from the cage to the window let her back or wing gently brush a drop of honey on the end of the finger, and she will soon stop to clean it off. I have had queens fly after being clipped, but when I cut off the large wing on only one side, just deep enough to take the tip of the small one in the same clip, she never flies again. It wounds her but little, as I give a slanting cut, taking more of the lace than of the fleshy part. Set the cage over her as before, carry her to the hive at once and let her run down among the combs, not in at the entrance. If all the mum old bee-keepers have known all about this, all these years, you are not the only man that *ought* to have a troubled conscience.

MRS. A. L. GOULD.

Ridgeville, Iroquois Co., Ill., April 13, 1878.

How to manage during swarming time, with clipped queens, will be considered under SWARMING.

HOW QUEENS LAY TWO KINDS OF EGGS.

That they do lay two kinds of eggs, I think few are inclined to dispute, since the experiments with the microscope have decided the matter so clearly, as given under DRONES. Suppose a young queen goes out

to meet the drones so late in the fall, or so early in the spring, that there are none; what is the consequence? Well, sometimes she will never lay at all; but, frequently, she commences to lay when 3 or 4 weeks old, and her eggs produce only drones. In fact, she can produce no other eggs, having never been fertilized. How shall we distinguish such queens from fertile ones? You can not decide positively concerning them, by any means that I know of, until their brood is ready to seal up; then you will know, by the round, raised caps of the brood, like bullets laid on a board, as I explained under DRONES. You can give a pretty good guess, by noticing the way in which she lays the eggs; if they are few and scattering, and sometimes, or often, in drone cells, coupled with the fact, that she did not commence laying until two weeks or more old, you would better not send her off as a dollar queen, until some of her brood is sealed over. A young queen, if properly fertilized, never, or very rarely, lays an egg in a drone cell, and when she commences to lay, she fills cell after cell in regular order, as men hoe a field of corn; her work also has a neat and finished appearance that says at once to the practiced eye, "You are all right."

Now, my friends, do not think me contradictory, when I tell you that a young queen sometimes commences with all, or nearly all, drone eggs, and, after awhile, lays entirely worker eggs as regular as one might wish. I do not know why this is; perhaps, she has not yet got used to the "machinery", or does not "remember" distinctly just how her grandmother did it. Once more, my friends; you must bear with me, when I tell you that any queen, the best one you ever saw, is liable, at any day of her life, to commence, on a sudden, laying drone eggs altogether, or only in part. I wish you to remember this, that you may be more charitable toward each other, in your dealings. A nice laying, young queen, taken from a hive, and shipped to a distance, may prove to be a drone layer shortly after, or immediately after, she is received. Such things are not very common, but they do occur. In an apiary of 50 or 100 hives, I should expect to find one drone layer, on an average, each spring. During the summer, perhaps one more will be found. It may be that the queen was not fertilized sufficiently, if I may use the term, and that the supply of spermatozoa gave out, while she was in full vigor, thus reducing her to the condition of

a virgin queen. Microscopic examination has shown an entire absence of spermatozoa, in at least one or two instances, where queens of this kind were killed and dissected. Similar experiments, given by Langstroth, show that the spermatozoa may be chilled beyond recovery, by chilling the queen, and yet the queen herself may be re-seucitated. I think it likely, that hardship and being shipped long distances may produce the same results. Do not think I am going to excuse those who sell queens, and let the blame for unprofitable queens slip off their shoulders; on the contrary, I think they had better make up their minds to render a full equivalent for all the money they receive. If a queen proves a drone layer before the purchaser can receive any benefit from her, I think another should be sent. Of course, I cannot give a rule for settling all such matters, but I would most earnestly advise that you all try to do as you would be done by, and be each one *ready* to bear a little more than your share of such losses as may come up. Try to feel for each other, and beware of that great besetting sin of all mankind, selfishness. It is certainly one of my great besetting sins, if I do not look out.

Well, queens not only turn suddenly to drone layers, but they sometimes produce about an equal number of each kind of eggs. In all these cases, where the queen lays drone eggs when she evidently intended to lay worker eggs, they are in worker cells; also the number of eggs laid, usually, rapidly decreases. The bees, as well as queen, evidently begin to think that something is wrong; queen cells are soon started, and after the young queen is hatched, she becomes fertile, and begins to help her mother. All hands evidently think that any kind of a queen is better than no queen, hence a queen is seldom dragged out of the hive, as a worker bee is, because she is ailing.

Very early in the spring, or late in the fall, or at any time when forage is not abundant, a queen will pass right by drone cells, taking no notice of them. I have often tried to get eggs in drone cells by feeding, and can but conclude that the queen knows when an egg will produce a drone, and knows just what "wires to pull" to have every egg laid in a drone cell produce a drone. I think it very likely the workers have something to do with this matter, but I have never been able to make out by what means they signify to the queen that some eggs in drone cells, or even queen cells, would be desirable. There seems to be a constant understanding

in the hive, as to what is going to be done next, and consequently there is no clashing. I wish, my friends, the human family could understand each other as well. In our apiary, there seems to be, in strong stocks, a kind of understanding that eggs shall be laid in drone cells about the last of March, and we, therefore, have drones some time in April, ready for the first queens that may, by any accident, make their appearance. Those who insist that there are only one kind of eggs can satisfy themselves easily, by cutting out a piece of comb, eggs and all, from either a drone or worker cell, and setting it in the bottom of a cell of the other kind. They will get a drone in a worker cell, or a worker in a drone cell. Again; if you give a young laying queen a hive supplied only with drone combs, she will rear worker brood in these drone cells. The mouth of the cells will be contracted with wax, as mentioned in HONEY COMB.

When they get ready to swarm, they build shallow queen cells, and the queen then lays a worker egg in these queen cells. Although I never saw her lay an egg in a queen cell, I am satisfied that she does it, from the way in which it is put in. Like the rest of the eggs, it is fastened to the center of the bottom of the cell, by one of its ends, and I suppose, when first deposited, it is covered with a sort of glutinous matter that makes it stick firmly, where it first touches. I know that bees have the skill to remove both eggs and larvæ, for I have several times known of their taking eggs and brood to an old dry comb, when no queen was present in the hive. Occasionally, a queen is found that will never lay at all; again, queens that laid eggs which never hatched into larvæ, have been several times reported. One such was sent me this past summer. She was a remarkably fine and large queen, but while being introduced, she flew away and has not come back yet.

Aug. 16, 1879.—We have to-day killed a large, fine looking queen, because not an egg she has layed in the two weeks she has been laying, has hatched into larval state. This is the first case of the kind we have had in rearing several thousand queens.

After having told you thus much of the faults and imperfections of queens, I would add, for their credit, that when once properly installed in a strong colony, they are about as safe property as anything I know of, for in the great majority of cases, they live and thrive for years. I have never heard of any disease among queens, and while a worker

lives only a few months, they often live 3 or 4 years. One that was imported from Italy by Dadant, furnished us brood and eggs for queen rearing, for four summers. I then sold her for \$2.00, and she died in being sent less than 50 miles. She was very large and heavy, and probably, being so old, could not cling to the sides of the cage like a younger one. I have never heard of queens being troubled with anything but an Italian parasite, and these quickly disappeared when they were introduced into our own apiaries. See ENEMIES OF BEES.

LOSS OF QUEEN.

It is a very important matter, to be able to know at once, when a queen is lost. During the months of May and June, the loss of a queen from the hive a single day will make quite a marked difference in the honey crop. If we assume the number of eggs a queen may lay in a day to be 3,000, by taking her away a single day, we should in the course of events be just that number of bees short, right during a yield of honey. To put it very moderately, a quart of bees might be taken out of the hive, by simply caging the queen for a single day. Beginners should remember this, for their untimely, or rather inconsiderate tinkering, just before the flow of honey comes, often cuts short their income, to a very considerable degree. Whatever you do, be very careful you do not drop the queens off the combs when handling them at this time of the year, and do not needlessly interrupt the queen in her work, by changing the combs about, so as to expose the brood, or upset their little household matters in the hive. With a little practice, you will be able to detect a queenless hive, simply by the way the bees behave themselves, on the outside. Where they stand around on the alighting board in a listless sort of way, with no bees going in with pollen, when other colonies are thus engaged, it is well to open the hive and take a look at them. If you find eggs and worker brood, you may be sure a queen is there, but if you do not, proceed at once to see if there is not a queen of some kind in the hive, that does not lay. If you do not find one, proceed at once to give them a frame containing brood and eggs, and see if they start queen cells. You ought to be able to find incipient queen cells, in about 12 hours, if the bees have been some little time queenless. As soon as you see these, give them a queen if possible. If no queen is to be had, they may be allowed to raise one, if the col-

ony has bees enough. If it has not, they had better be united with some other stock.

A strong hive discovered to be queenless in the months of Oct. or Nov., may be wintered without trouble, and I am not sure but that a colony kept without a queen until natural pollen can be gathered in the spring is just as well off as one that commences rearing brood by the first of Jan., as they usually do. If you have no queen to give them in the spring, give them a comb of eggs from some other stock, at intervals of a week or 10 days, until they can rear a queen that will be fertilized. If the first queen reared should prove a drone layer, she must be destroyed that they may have an opportunity of rearing another that will not be over a couple of weeks old, when drones begin to fly. This of course takes time and care, so we generally prefer to have a laying queen in each hive, at the approach of winter.

More hives become queenless from queens being lost on their wedding flight, than from all other causes together, but the reasons for this have been so fully stated under other heads, such as HOUSE APIARIES, APIARIES, NUCLEUS HIVES and the like, that it will hardly be necessary to go over the ground here. If the hives are 7 feet apart from centre to centre, as in the hexagonal apiary, there will be little loss of queens from this cause. Where a queen is lost in such a way as to leave brood in the hive from which to rear another, the colony seldom perishes, but when a virgin queen takes her flight, if she is lost, no brood remains in the hive, unless it is supplied by the bee-keeper; hence, the very great importance of having a few eggs in every nucleus hive, all the time during QUEEN REARING, which see.

ODOR OF A LAYING QUEEN.

After bees have been some time queenless, they usually become, if no fertile workers make their appearance (see FERTILE WORKERS), very eager for the presence of a queen; and I can in no way describe this eager behavior, if I may so term it, so well as to describe another way of testing a colony you have reason to suspect is queenless. Take a cage or box containing a laying queen, and hold either the cage, or simply the cover of it, over the bees, or hold it in such a way, as to let one corner touch the frames. If queenless, the first that catch the scent of the piece of wood on which the queen has clustered will begin to move their wings in token of rejoicing, and soon you will have nearly the whole swarm hanging to the cage, or cover. When they behave in this manner, I have

never had any trouble in letting the queen right out at once. Such cases are generally where a colony is found without brood in the spring.

There is something very peculiar about the scent of a laying queen. After having had a queen in my fingers, I have had bees follow me and gather about my hand, even when I had gone some distance from the apiary. By this strange instinct, they will often hover about the spot where the queen has alighted even for an instant, for hours, and sometimes, for a day or two afterward. Where clipped queens get down into the grass or weeds, or crawl sometimes a considerable distance from the hive, I have often found them, by watching the bees that were crawling about, along the path she had taken. When cages containing queens are being carried away, bees will often come and light on the cage, making that peculiar shaking of the wings, which indicates their joy at finding the queen.

QUEENS' STINGS.

There is something very strange in the fact that a queen very rarely uses her sting, even under the greatest provocation possible, unless it is toward a rival queen. In fact, they may be pinched, or pulled limb from limb, without even showing any symptoms of protruding the sting at all, but as soon as you put them in a cage, or under a tumbler with another queen, the fatal sting is almost sure to be used at once. There seems to be a most wise provision in this, for if the queen used her sting at every provocation as does the worker, the prosperity of the colony would be almost constantly endangered. It is true, that instances are on record, where queens have stung the fingers of those handling them, but these cases are so very rare, it is quite safe to say queens never sting. I am inclined to think the cases mentioned (although, of course, it must be only a surmise) were with queens that were not fully developed; for I have often seen the dark half queen and half worker, mentioned some time back, show its sting, when handled as we usually handle queens. It is said, that a queen has been known to lay eggs, after having lost her sting, but as they never lose their stings, so far as I know, at least, when they sting rival queens, we must consider this as a very unusual occurrence. When you wish to pick queens from a comb, you can do it with just as much assurance of safety, as if you were picking up a drone. It is true, the queen often bites, with her powerful mandibles,

and she does this so viciously, that a novice might be almost excusable for letting her get away in affright.

CAUTION IN REGARD TO DECIDING A STOCK TO BE QUEENLESS.

As a rule, we may say that absence of brood or eggs is a pretty sure indication of queenlessness; but it should be borne in mind that all hives, as a rule, are without eggs and brood in the fall and early winter months, or, in fact, at any time when there is a considerable dearth of pasturage. At such seasons, beginners are more apt to think their hives are queenless, because the queens are much smaller than when they are laying profusely. Weak colonies often cease laying during the whole of the winter months.

CAUTION ABOUT CLIPPING QUEENS' WINGS.

Although it would seem, after what has been said, that nobody would ever think of clipping a queen before she has begun to lay, I am sorry to say that several of the A B C class have been so thoughtless as to clip virgin queens. Of course, such a queen would be about as worthless as if it had been her head instead of her wing that was clipped off; for she could never meet the drones at all. It has usually been done where a queen of an after swarm has been caught, and it should be remembered that such are always virgin queens.

QUEEN REARING. It has been said that wax and honey are the merchantable products of the apiary, but ever since the advent of the Italians there has been a constant call for queens, far ahead of the supply; and if we were asked what product of the apiary would bring cash quickest and surest, we would unhesitatingly say "dollar queens." It may be well to explain here that a dollar queen is one that has been reared from a pure mother, and has just commenced to lay. She may prove to be purely fertilized, and she may not, but the apiarist, for this low price, guarantees nothing more than that she has been raised from a pure mother. The transaction of the sale is supposed to be something as if you were standing by his side, and he should open a hive and say:

"There is a queen that was reared from brood from a pure mother; she has commenced laying as you see, but I know nothing of the kind of bees she may produce. You can take her just as she is for \$1.00, but at that price I can be in no way responsible further."

As the demand is usually far in advance of the supply, the conscientious apiarist can only fill orders in their turn, and this has been another cause for dissatisfaction, on account of the delays that seem unavoidable, especially in the spring when everybody is wanting them right away. I do not mean to blame those who want them at once, for it is my disposition exactly, to want a thing as soon as I have paid for it.

If you can raise good dollar queens, you can certainly raise good tested ones, for a tested queen is nothing more than one that has proved herself prolific and purely fertilized. The test of purity generally recognized is that the workers show plainly the three yellow bands that are characteristic of the Italians.

There are ever so many ways of forming nuclei for queen rearing, but after having tried pretty thoroughly almost or quite all of them, I shall advise separate hives for each nucleus. If you are simply increasing your stock, use a new hive for each colony, but if you wish to add to your income by rearing queens for sale, I would advise a two comb hive for the purpose. These are made much like the *Simplicities* only that they are 3½ inches wide inside instead of 14½. For lightness, we will make the sides of ¾ stuff. For reasons to be explained we will have the cover shut over the hive like the cover of a tool chest, and loose enough to slip over the bottom also, without sticking, for we can have no pulling and jerking about bee hives, even though they are "little ones."

Those who have tried queen rearing, have perhaps found it tiresome business to stoop so much as is required in looking over so many little hives. To remedy this, we will have them fastened to the grapevine trellises as shown in the cut on back cover, except that the entrance should be on the opposite end from that of the hive below.

This brings them at a convenient height to work easily; we certainly would not wish to encourage any one in being lazy, but apiarists do sometimes get tired, and find it quite a relief to sit down for a moment or two, and the hive right below the nucleus, we find very convenient.

In inserting queen cells, putting in brood, etc., we also find the top of the hive quite a convenience. These nuclei are shaded by the broad leaves of the grapevines, and are held from being blown down by the wind by a screw put through the upper strip into the side of the hive; when a nucleus is to be sold, the screw is turned out enough to re-

lease it, the cover put under the hive, closing the entrance, a wire cloth cover tacked over the top, and it is all ready for the express office. It may be well to remark here that nothing will insure careful handling like leaving the top of the hive so that every one that takes hold of the hive can see the bees plainly through the wire cloth. You may label a box "glass," "handle with care," "right side up," and as much more as you like, and it will not be half so plain to the railroad and express men, as the sight and sound of the bees buzzing right under their noses.

When you have your nuclei all fixed, each one neatly painted white (see paint for hives) and supplied with a queen register card, you are to set about peopling the little boxes. If you commence this work during a good yield of honey, you will very likely get along finely, but if at a time when the bees are disposed to robbing, you may have all sorts of trouble. You can have your queen cells raised in these little hives if they are well peopled with bees, but as a general thing we would prefer having it done by a strong colony.

HOW TO GET GOOD QUEEN CELLS.

To rear good, healthy, long lived queens, we want the larvæ to have an abundance of the milky food prepared by the nurse bees, and we wish them to have it from the time they are first hatched from the egg, until they are sealed up as a queen cell. If you will examine the minute larvæ of different hives, you will discover a vast difference in the amount of food given to the infant bees. With a new swarm, we will find the first larvæ that hatches is fed so profusely that they look almost like the inmates of queen cells, because the nurse bees are far in excess of the work that is to be done by them, but after the combs are filled with eggs, such is not the case. We can bring about this result at any time by taking all the brood away from any colony, and giving them only one comb containing this small larvæ, and this is just what we want for queen-rearing. The secret of being able to send larvæ for queen rearing safely by mail, consists in sending such as have this excess of food in the cells, for if the weather is not too cool, they will grow and thrive for two or three days, just as well, for aught I know, as if they were in the parent hive; when the food is all consumed, they must starve, and this illustrates the necessity of getting them into a hive of bees just as soon as they are received. It has been said that queens reared

during the time of natural swarming are superior, but I think by securing this abundance of food in the way indicated, we can have them equally as good at any season when bees are flying freely. True it is some trouble to remove all the brood combs from a strong colony, and we therefore move the colony hive and all, putting a new hive containing our choice larvæ in its stead. This plan has never failed to give us fine queen cells, and queens that were prolific and long lived; and it is so quickly done that a lot of cells may be started every few days during the season. Unless the new hive looks much like the old one, the bees may but few of them go into it, especially if the old one is set so near at hand that they succeed in finding it. This is an additional reason for having your hives all just alike. We usually place the removed hive at an opposite side of the apiary.

WHEN TO CUT OUT THE QUEEN CELLS.

A queen is hatched in just 16 days from the time the egg is laid, as a general rule; therefore we must take measures to have the cells cut out before this time. The eggs hatch into the minute larvæ, in just about three days, and if you have used these, you are to cut out your cells on the 12th day after you moved the colony. If you use a comb containing larvæ of all ages, the bees will be pretty sure to use some that are 6 days old, in which case you may have queens hatching by the 10th after the larvæ was given them, and they *may* get out a young queen as soon as the 9th. It is these queens that are hatched on the 9th or 10th day, that we have reason to fear may be short lived; hence our warning to give them nothing for starting queen cells but larvæ so small as to be just visible to the naked eye. You will get these by putting an empty comb between two brood combs, as we have before directed, until the eggs laid by the queen have just commenced to hatch. A frame of foundation answers nicely.

HOW TO CUT OUT THE QUEEN CELLS.

Provide yourself with a very thin narrow bladed pen-knife, and be sure that it is just as sharp as you can make it. If you have a dull knife and it is necessary to cut between two cells that are very close, you will very likely break one or both open, and then the bees will be very apt to tear them down. Cut them all out but one, and do it nicely. If they are not too close together give considerable room around the base or part that is attached to the comb.

We will suppose you have secured a fine lot of cells, have succeeded in cutting them out nicely, and have them all shut up in a little box where robber bees may not be trying to steal the honey that may have been started running in the operation of cutting them out. Do not let the robbers discover that honey may be pilfered by following you around, or you may receive some stinging lessons as a punishment for not being neat and cleanly in your work.

The little hives, we will suppose, are securely fastened on their shelves, and are all ready for their occupants. Go to any strong colony and gently lift out one of the central combs. This you can do by sliding the frame on each side a little away from it, or if the combs are crammed with honey, you may find it necessary to push a second or a third one back a little. You can make room to take out the first one quietly, in almost any hive, if you manage properly. Now we rather wish to find the queen, if we can by not taking too much time, and so we carefully look over every comb as we lift it out. If you do not find her on the first comb, put it in one of the little hives and take another. Proceed in this way until you have removed all the brood combs. As soon as you have found the queen, you are to put her with the comb she is on, in an empty hive. Now you can insert a cell in each comb as fast as you take them from the hive, and then place the comb, cell and all, in your nucleus hive.⁶⁵ If the comb contains hatching brood, the one will be sufficient, but if the brood is partly unsealed you had better put another beside it, or the brood may be chilled during cool nights.

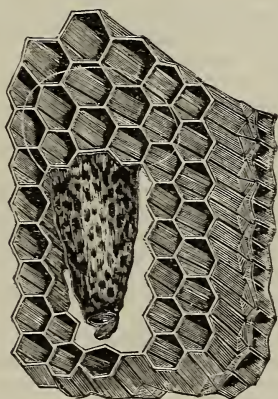
You will probably make 5 good nuclei out of a fair colony, the bees that are in the fields will make another good one, and the old queen with her one comb still another.⁶⁶ If you do not find the old queen, divide the hive all the same, but do not insert any queen cells until you find her. If you are so unlucky as to not find her at all, wait until the next morning, and then insert queen cells in all that have started some of their own, for it is a sure indication of queenlessness to find a nucleus building queen cells. Mark this, for I shall refer to it again.

HOW TO INSERT A QUEEN CELL.

The drawing given will probably make it all plain, without much explanation. Your cells must be fitted in nicely, and pretty securely, or the bees will tumble them down to the bottom of the hives, for they are quite inquisitive in regard to the way things are

done in their homes. I once thought I had made quite a discovery when I found that cells could be hatched safely by laying them just under the quilt on the top of the frames, or even at the entrance during very warm weather, but I soon found that a much larger part were torn down, than if they were nicely inserted in the midst of the brood.* Where it can be done, I always insert a cell in place of one they have built, and I have never found such ones destroyed.⁶⁷ A cell that has been broken open in cutting it out, will usually be destroyed, but not always.

If your cells were cut out at just about the proper time, you will very likely find some of the queens hatched by the next day, and in ten days more, on an average, they will be laying. I took a dollar queen from one of these nuclei just ten days ago, inserting a queen cell at the time, and to-day the new queen is laying. Now 100 of these little hives would, at this rate, give us 10 laying queens per day, and I think that an apiarist should consider it fair wages, even if half the whole number were lost, in different ways; and one person can very easily take care of 100, if he will follow the directions I shall give.



When I first commenced queen rearing, I thought it necessary to hunt up the young queens every time a cell was found open, or every time I looked into their hives, which, by the way, was about every day, and sometimes oftener. If you are keeping bees just for the fun of it, it may do to spend a quarter of an hour looking for a queen just to see if she is a nice one, but if you are trying

to show your friends who worry about the time you "fuss with your bees" that there are dollars in the business, you need never see your queens at all until you wish to send them off. After inserting the cells, you have nothing more to do with them for about three days, and then you should provide yourself with a fresh lot of cells, and also with some pieces of comb containing larvæ just right for queen rearing. Take the hives in regular order and do not skip about. If you find a cell open at the end, your queen is probably all right,* and if there is no larvæ in the hive, insert a piece; as soon as anything happens to a queen, they will start queen cells on this brood, and therefore we always look at this piece of brood instead of looking for the queen. Should they by any possibility rear a queen of their own, it will always be from your choice brood. When in your examinations you find eggs in the cells—your eyes will soon become sharpened for these indications of greenbacks—you will turn the queen register to laying, and use her the first time you send off queens. As we wish to keep up the population of these little hives, it may be well to allow her to fill up her two combs pretty well before taking her out. When she is removed, insert a cell, and if all goes well you may have another queen in the hive the next morning. Always keep your queen register set, that it may show the state of affairs within, and be sure the bees always have brood in their combs, by giving them a fresh piece every three or four days. If you are faithful in this, you will never know anything about *fertile workers*, these pests of queen rearing.

CAUTION.

In selecting brood for queen rearing, be sure you have no drone larvæ, for the bees, by some strange perversion of instinct, will very often build queen cells over them, resulting usually in nothing but a dead drone. The poor drone seems unable to stand the powerful dose of concentrated food that is required to perfect a queen from a worker larva, and so dies when he is about half grown. Should a queen cell have been started over a drone larva, you can always tell it from a good one by its smooth exterior, while a genuine cell has a roughened surface like the drawing we have given.

If you suspect a cell is not going to hatch, do not tear it down, but insert another one

* During the past summer of 1882 our boys have been quite successful by simply placing the cell between two frames of brood. It is placed down near the center of the brood, in its natural position, and then held securely by moving the comb up so as to press it pretty well. This is quickly done, and it avoids cutting unsightly holes in our nice frames of foundation.

* If you find the cap hanging as in the cut, you may be sure a queen has gnawed her way out; sometimes this cap springs back and the novice waits day after day, while the queen is running about the combs.

beside it. If you have two or more cells so close together that they cannot be separated, insert the whole, and look often to them; you can very often find the first one while she is lifting out, or so soon after she has come out as to save the others. We have often, by this means, saved all of three that were built close together.

For convenience in inserting brood so many times, we use a square "cake cutter," as it were; this is made of tin, with the edges very sharp. Press it in the comb far enough to mark it, and then you can cut out pieces all of a size. As one piece always goes in where another comes out, you can keep all unsightly holes in your combs closed up, and have no odd bits of comb lying about the apiary.

In concluding the subject of queens and queen rearing, my friends, I will give you an article from *GLEANINGS*, by one whom I regard as one of the most successful queen rearers in America. Friend H. seems to have a happy tact for making every thing pertaining to the business a success.

HOW TO RAISE QUEENS FOR MARKET.

For nuclei, I use a hive similar to the Simplicity; that is, a plain box, made the same size as the Langstroth hive, with movable cover and bottom board, and one division board made the same size as the frame, so as to be entirely movable. On each hive I have the registering card described in your circular, by means of which I can tell, at a glance, the probable condition of the hive, without the necessity of opening it. I use the full sized hive, because it costs but little more than the two frame hive, and can be used for full stocks or nuclei, as may be most convenient; and, when not in use in the yard, it is very convenient in the honey house, for storing surplus combs. By sliding the division board back, I have immediate control of the combs, and can get at the queen very quickly; while, in the two frame hive, it requires some time and care to get the combs out without injury, and, if the hive should happen to contain cross hybrids, so as to necessitate the use of smoke, she is sure to run down on the bottom, where it is very difficult to get at her, in the narrow hive.

To stock the nuclei, I take, from a full colony, a comb containing hatching bees and plenty of stores, which I place in one side of the hive, with the division board close to the frame. I also give them enough young bees from other combs to make them sufficiently strong. When they require more room I give them an empty comb; and, in a short time, during the honey season, I can build them up into good stocks, if it is desirable to do so.

I have most of the queen cells built in full colonies, as I generally get the largest number of perfect queens in this manner; although some of the finest queens sent out by me, this year, were from cells built in strong nuclei. What seems to be required, is to have the cell building colony in as nearly a normal condition as possible, not necessarily very populous. Some bees naturally build more cells than others. By forming strong nucleus hives from these, and keeping up the normal condition, by oc-

casional giving them hatching bees from the same old stock, we could probably get more cells, with less expense, than in any other way.

To have a colony build queen cells, I first remove the old queen; in 8 days, I pick out all the cells that have been built, and place in the centre of the hive a comb containing larvæ not over one day old, from the queen I breed from. These I obtain by placing an empty comb in the centre of her brood nest, about four days before it is needed. For this purpose I use *light colored* combs. Bees seem to prefer to build their queen cells on the edges of the combs; on this account, I cut a few slits about one-half inch wide in the comb, before placing it in the cell building colony. In about eight days, this comb is ready to take out and put in the nursery, and be replaced by another similar one. I can generally get four or five good lots of cells from a hive, before the youngest bees are too old to raise perfect queens.

My nursery is made according to the description in your circular, and is a very great convenience; in fact, I could not raise queens, at present prices, without it. When a queen is hatched in the nursery, I can tell at a glance, whether she is perfect; while, if the cell were in a nucleus, I would have to spend some time in looking for her, and might have to open the hive several times before I would find her hatched. It is usually 8 or 10 days after a queen is hatched, before she begins to lay; therefore, it is quite important to know immediately that she is perfect, so as to save this time, if she is not. The nursery also saves, to the bees, the time required to hatch the cells, after they are sealed; say five or six days for each cell.

The time required in introducing is but little, if any, more than is necessary to cut out the cells, and place them in the different hives; and this season the loss has been no greater.

I examine the combs in the nursery every two or three hours, to find the young queens; and, before leaving it for the night, I hunt up what queens are likely to hatch before morning, and cut out the cells containing them, and put them in cages. Here is where the light colored combs show their advantage; by holding them up to the light, the queens that are nearly developed, can be seen to move slightly, and are pretty sure to come out in either 6 or 8 hours. If they should have the run of the combs an hour or two, they would be pretty certain to murder some of their sisters.

I introduce the young queens to their nucleus hives, as soon as possible after they are hatched, when the honey harvest is good; this usually requires but a moment. I let them run in at the top of the hive, giving them and the bees a good smoking, and feel quite safe about them. But if the bees are not getting much honey, and are inclined to be cross, it requires more care. I move the division board back, so as to give a good view of the comb, then let the queen run in among the bees, giving them all a good smoking, and watching them a few moments, until they become quiet. If they treat her respectfully, she is pretty sure to be safe; but, if any attack her, I smoke them again. They seldom require this the third time. With care, and by taking sufficient time (and a good queen is worth it), I lose very few; although there are times when the utmost care results in failure. There seem to be climatic influences, at times, that control the matter, and which are beyond my knowledge. For instance, during the clover season, I lost nearly all of one fine

batch of queens, while a similar lot, introduced in the same manner a few days previous, were well received; and I have had but little trouble since. It seems that feeble hives are more inclined to receive queens peaceably, and, on that account, I keep my nuclei as weak as possible and still have them self-sustaining. I also have better success in introducing to hives that have been queenless several days, and have cells well started.

I have, this year, abandoned the plan of having the hives arranged in straight rows and at regular distances, and now have them grouped about various small trees. This arrangement is not so pleasing to the mechanical eye, but it seems to suit the young queens much better than the former arrangement, and I lose scarcely any now during their marriage flight.

For shipping purposes, I use the "Five cent candy cage," having the candy fresh. I find that queens, and most of the bees, will live in these small cages from 12 to 15 days, if the candy is just right. In provisioning the cages I put in more candy than the bees would be likely to use, because a greater bulk together will retain the moisture longer.

I use granulated sugar for candy, and prepare it as follows: Wet it with a *very little* hot water, just sufficient to dissolve it, boil it until it will grain when stirred in a cold dish (it requires but very little boiling), then take it from the fire and stir it until it becomes slightly cloudy, and pour it into cages as fast as possible. If it gets cold before it is all poured out, I have to heat it up again with a little more water.

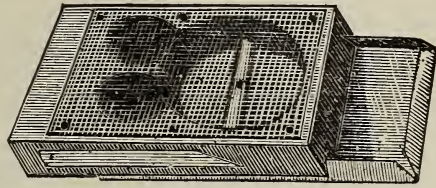
What seems to be necessary, is to dissolve the sugar in as little water as possible, and then stir it enough so that when cold a slight crust will cover the surface, while the interior will be soft and creamy; in this condition the water evaporates very slowly. It is probable that the loss of so many queens this season is more due to the character of the candy, than the size of the cage.

To fill the cages for shipment, I take a lot of them containing enough for the day's orders, and remove the slide that closes the openings. I pick up all the bees, including the queens, by the wing, putting into the first cage the first queen and her *suite* composed of 6 or 8 bees in the prime of life, which are easily distinguished by their clean, bright appearance. These work the candy better than very young bees, and are more likely to stand the confinement than old ones. After putting in each bee, I close the opening with my thumb, until they are all in, when I use the slide for this purpose. I then fill the second one in the same manner, and so on through the whole lot. E. M. HAYHURST.

Kansas City, Mo., Aug. 10, 1879.

LATER.

Heigho! It is now June, 1882, and we have found that, while the Viallon candy does nicely in the spring, or during ordinary summer weather, it will not do at all for an autumn drought, and so we have been compelled to come back to the bottle again. The cut at the top of the next column shows the cage now in use, with a tin water-bottle in place.



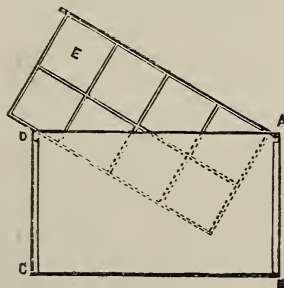
LATEST IMPROVED PEET CAGE.

STILL LATER.—What a world of changes this is! Since the above was written, friend I. R. Good, of Nappanee, Ind., has astonished the whole bee world by discovering that a candy composed of simple honey and granulated sugar, stirred together cold, is superior to all other candies, not only for sending queens and bees, but for feeding and wintering, or doing anything else where a bee-candy is wanted. We have used it several months, and have had most excellent success with it. The sugar is stirred in until it forms a thick dough, as it were, and this is left to stand until the grain of the sugar seems to mostly disappear. It doesn't seem to daub bees, and it answers without water for at least a week or ten days. The cage shown above holds it nicely, but the openings from the smaller into the larger hole must not be much larger than to admit a bee.

May, 1883.—No changes have been made in the above, further than to use the purest *powdered* sugar instead of granulated. This mixes with the honey quickly, and does not rattle out of the cages like the granulated sugar.

HOW TO CAGE THE BEES AND QUEEN.

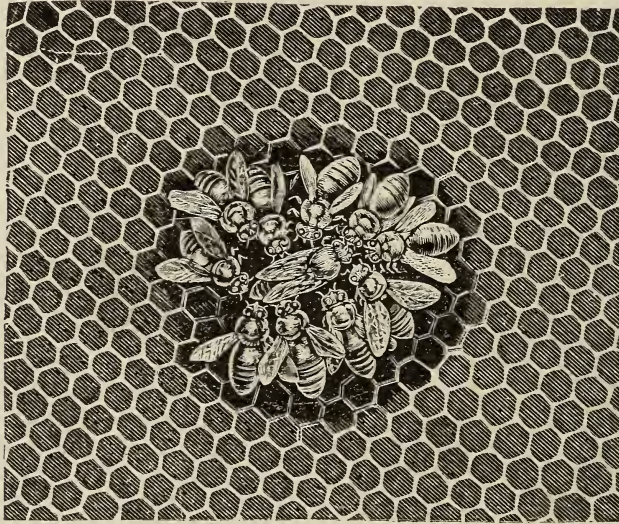
Open your hive without smoke if you can; if you cannot, use as little smoke as possible. When the bees have become quiet, lift out the frames until you find the one containing the queen, and stand it in the hive in the position shown in the diagram.



Set the frame so that the queen is on the part projecting out of the hive. Open the cage just as you see it in the engraving, and

hold it in your left hand, while your thumb covers the entrance. Now pick the queen up by both wings, or by her shoulders, while you put her into the cage. Put your thumb over the entrance at once, or she will crawl out in a twinkling. Now we want none but young bees to put with her, so we will look on the frame, for those that are dipping their noses into the unsealed honey. As their

bodies are bent, we have an excellent opportunity to pick them up by the wings, and with a little practice you should be able to put them in the cage about as fast as you would grains of corn. Young bees will never sting your thumb, unless they happen to be very bad hybrids, but old ones will sometimes venture to do so, if you happen to handle them too roughly.



THE QUEEN AND HER RETINUE.

R.

RAPE (*Brassica*). This plant is a near relative of the turnip, cabbage, mustard, etc. All of them yield honey largely, where grown in sufficient quantities. As rape is the only one of which the seed is utilized for purposes other than for increase, it should play a prominent part on the honey farm. It would seem, in fact, that it is almost the only plant that should stand beside BUCKWHEAT, or rather perhaps above it, for the honey from the rape is very much superior to buckwheat honey. The great drawback is the lack of hardness of the young plants, when they first come up. In our locality, the black flea is almost sure to eat the tender green leaves when they first make their appearance. Our neighbors have several times tried considerable fields of it, but though it would come up nicely, this flea would take off almost every plant. In other localities, we have had reports of bountiful crops of seed, and honey enough so that the bees worked beautifully in the surplus receptacles. Like buckwheat, it commences to blossom when quite small, and continues in bloom until the plant has gained its full height. As it will bloom in 20 days after sowing, it may be sowed almost any time in the summer; and it is said to escape the ravages of the flea best, when sown late. We have had it yield *honey* finely when sown the first of August. The ground should be very finely pulverized, for the seeds are very small. It is sown broadcast, three pounds of seed to the acre. There is a steady and good demand for the seed, for feeding canary birds, as well as for the manufacture of oil. Bee-keepers should contrive to induce seedsmen to have all these seeds raised near them, or on their own grounds. Dealers in bird seed should also be furnished in the same way, for these things are often raised in large quantities, where there are few, if any, bees to gather the honey. From what I have said on POLLEN, you will understand that both parties would be benefited by the arrangement.

RASPBERRY. Where this fruit is raised largely for the market, it is quite an

important honey plant; but it would hardly be advisable to think of raising it for honey alone. The bees work on it closely in our locality, but we have not enough of it to judge of the honey. If bee-keepers and growers of small fruits could manage to locate near each other, it would probably be an advantage to both. Langstroth says of the raspberry honey: "In flavor, it is superior to that from white clover, while its delicate comb almost melts in the mouth. When it is in blossom, bees hold even white clover in light esteem. Its drooping blossoms protect the honey from moisture, and they work upon it when the weather is so wet they can obtain nothing from the upright blossoms of the white clover."

In our locality, it comes in bloom just after fruit blossoms, and just before clover, so that large fields of it would be a great acquisition indeed. The red varieties (especially the Cuthbert) are said to furnish most honey. We have now (December, 1879) about one-fourth of an acre of the best raspberries for honey on our honey-farm.

RATAN. This plant has been several times spoken of by our southern friends, and it is probably quite an important honey plant. Some seed has been sent me, but no plants have as yet been raised. I will give farther reports, as soon as I can.

ROBBING. Paul says, "The love of money is the root of all evil." I should be inclined to state it in this way: the disposition to get money without rendering an equivalent, is the root of all evil. Well, the root of a great many evils, in bee-keeping, is the disposition of the bees to gain honey without rendering any equivalent. Some one of our A B C class has said that he found bees making visits to over 100 clover heads, before they obtained a load sufficient to carry to their hives. I think it very likely, that during a great part of the season, a bee will be absent a full hour, or it may be, during unfavorable spells, as much as two hours, in obtaining a single load. Is it at all strange, that a bee, after having labored thus hard

during the fore part of the day, should, in the afternoon, take a notion to see if he could not make a living in some easier way? Would he be very much worse than many types of humanity? Well, as he passes around to other hives, he catches the perfume of the clover honey they have gathered in a like manner, and by some sort of an operation in his little head, he figures out that if he could abstract some of this, unperceived, and get it safely into his own hive, he would be so much the gainer. I presume he has no sort of care, whether these other folks die of starvation or not. That is no concern of his, at all.

With all of their wonderful instincts, I have never been able to gather that the bees of one hive ever have any spark of solicitude as to the welfare of their neighbors. If, by loss of a queen, the population of any hive becomes weak, and the bees too old to defend their stores, the very moment the fact is discovered by other swarms, they rush in and knock down the sentinels, with the most perfect indifference, plunder the ruined home of its last bit of provision, and then rejoice in their own home, it may be but a yard away, while their defrauded neighbors are so weak from starvation, as to have fallen to the bottom of the hives, being only just able to feebly attempt to crawl out at the entrance. Had it been some of their own flock, the case would have been very different indeed; for the first bee of a starving colony will carry food around to his comrades, as soon as he has imbibed enough of the food furnished to have the strength to stagger to them.

Well, suppose the bee mentioned above, in prowling around in the afternoon or some other time, should find a colony so weak, or so careless, that he could slip in unobserved, and get a load from some of the unsealed cells, and get out again. After he has passed the sentinels outside, he will usually run but little danger from those inside, for they seem to take it for granted that every bee inside is one of their number. There is danger though, for should he betray too great haste in repairing to the combs of honey, they will often suspect something; so he assumes an indifference he is far from feeling, and loiters about very much as if he was at home, and finally, with a very well assumed air of one who thinks he will take a lunch, he goes to the cells, and commences to fill up. Very often, when he gets pretty well "podded out" with his load, some bee approaches, apparently to see if all is right. When the robber

once gets his head into a cell, however, he seems to have lost all sense or reason, and if he is discovered at this stage to be a stranger and a thief, he is often pounced upon and stung with very little ceremony. How do they know a stranger from one of their own number, where there are so many? It is said, they know by the sense of smell; this may be the principal means of distinguishing strangers from their own number, but I think they depend greatly on the actions and behavior of a bee, much as we do when judging of the responsibility of a man who asks to be trusted. We can give a very good guess, simply by his air or manner, or even by the sort of a letter he writes. If a robber is suspected, and a bee approaches for the purpose of satisfying himself, it is a very critical moment, and one becomes intensely interested in watching the performance. The robber will stand his ground, if he is an old hand, and permit himself to be looked over with a wonderful indifference, but one who has watched such scenes closely will detect a certain uneasiness, and a disposition to move slowly toward the entrance, that he may be the better able to get out quickly, when he discovers things to be too hot for him inside. If the bee who first suspects him concludes he is an interloper, he begins to bite him, and grab hold of his wings to hold on until others can come to help. The thief has now two chances to escape, and sometimes he seems meditating which to adopt; one is to brave it out until they shall perhaps let him alone, and then slip out unobserved. The other is to break away, and trust to his heels and wings. The latter plan is the one generally adopted, unless he is a very old and "hardened sinner" in the business. One who has been many times in such scrapes will usually get away, by the latter plan, by an adroit series of twists, turns, and tumbles, even though three or four bees have hold of him at once. Some of these fellows, by a sudden and unexpected dash, will liberate themselves in a manner that is also wonderful, and then, as if to show their audacity, will wheel about and come back close to the noses of their retainers of a minute before.

But in case the bee gets his load, and makes his way out unobserved, he gets home very quickly, you may be sure, and under the influence of this new passion for easily replenishing his hive with the coveted sweets, he rushes out with a vehemence never known under any other circumstances. Back he goes and repeats the operation, with

several of his comrades at his heels. Does he tell them where to go? I wish to digress enough here to say, that I do not believe in a so called language among bees, or animals in general, further than certain simple sounds which they utter, and which we may learn to interpret almost, if not quite, as well as they do. When a bee comes into the hive in such unusual haste, podded out with his load in a way also rather unusual where it is obtained from ordinary stores, his comrades at once notice it, and either from memory or instinct, they are suddenly seized with the same kind of passion and excitement. Those who have had experience at the gambling table, or in wild speculations of other kinds, can understand the fierce and reckless spirit that stirs these little fellows. Patent hives illustrate the matter very well. A man who afterwards became editor of a bee journal once held up before my untutored eyes, a right to make a patent hive, saying:

"Mr. Root, I get \$5.00 for these rights, and they do not cost me more than the paper they are printed on—less than half a cent apiece."

The idea that \$5.00 bills could be picked up in that way, compared with the slow way I was in the habit of earning them, so impressed itself on my mind that I could hardly sleep nights; but after I had taken that amount from several of my friends and neighbors for the "right," I concluded that money without a clear conscience is not just the thing after all. Can we blame the poor bees, for being so much human? Well, the bees, when they see a comrade return in the way mentioned, seem to know without any verbal explanation, that the plunder is stolen. Anxious to have "a finger in the pie," they tumble out of the hive, and look about, and perhaps listen, too, to find where the spoil is to be had. If they have, at any former time, been robbing any particular hive, they will repair at once to that; but if it is found well guarded, those used to the business will proceed to examine every hive in the apiary. As an illustration of the way in which they communicate, or rather observe the movements of each other, see account of bees getting into the honey house, given in POLLEN.

Of course, they have particular notes, as of joy, sorrow, anger, despair, etc., which are produced by the wings, usually when on the wing, but I am quite sure they are unable to communicate to each other more than a single idea. In other words, they have no faculty of telling their fellows that a lot of hon-

ey is to be had in a feeder at the entrance, and that it would better be brought in quickly, or other bees may find it. A bee goes out in the spring, and by smelling around the buds, discovers honey and pollen; when he comes into the hive, the others see it and start out, and hunt it up in a similar way. For more on this subject, see SWARMING.

If you will turn back and read ANGER OF BEES, you will get a very good idea of the causes that start bees to robbing. Read also, BEE-HUNTING, FEEDING, etc. As a general thing, bees will never rob so long as plenty of honey is to be had in the fields. During a bountiful flow, I have tried in vain to get bees to take any notice of honey left around the apiary. At such times, we can use the extractor right in the open air, close to the sides of the hives, if need be. On one occasion, I remember leaving a comb of unsealed honey on the top of a hive, from morning until noon, and not a bee had touched it. It seems, they preferred to go to the clover fields, in the regular way, rather than to take several pounds from the top of a neighboring hive. I can readily suppose that they did not have to visit anything like a hundred blossoms at this time, and perhaps they secured a load in going to not more than a half dozen. Such a state of affairs is not very usual in our locality. We have very few days during the season, when it would be safe to use the extractor for a whole day in the open air; the bees will generally learn to follow the freshly uncapped combs about, and that it is easier than going to the fields. The first indication of robbing which you will have, will probably be the cool and wicked way of stinging, that I have described in ANGER OF BEES.

After the season begins to fail, you may expect that every colony in your apiary will be tried. As a rule, any fair colony will have sentinels posted to guard the entrance, as soon as there is a need of any such precautions. The bee that presumes to think he may enter for plunder will be led off by "the ear," if I may so express it, and this will be repeated, until he learns that there is no chance for speculation at that house. At the close of the honey harvest, we should be sure that there are no feeble hives that may be overpowered, for one such may start the fashion of robbing, and make it a much harder matter to control this propensity. An apiary, like a community, may get so demoralized, that thieving becomes a universal mania. "A stitch in time will save" a great many more than nine, in this case. Be

sure that each colony has the entrance contracted, and, in fact, the space occupied by the bees also, in proportion to their numbers. Give them only so many combs as they can cover, if you wish them to defend them properly, from either moths or robbers. A colony without either queen or brood is not apt to fight for their stores very vigorously, so it will be well to see that they have either one or both, should there be an attack made on them. It is hardly necessary to repeat what has been said about Italians being better to defend their stores than the common bees. A dozen Italians will often defend a hive better than a whole swarm of black bees.

COLONIES THAT WILL MAKE NO DEFENSE.

Although this is contrary to the rule when the queen and number of bees are all right, yet such cases do sometimes come up. I have found that colonies which have been wintered in-doors are most liable to get into that peculiar state, where they will allow bees from other colonies to come in and help themselves without molestation, yet it is not always the case. When they cannot be stirred up so as to show a particle of spunk or resentment, the temptation is sometimes very strong to say, "It is good enough for them; they ought to starve." This might be gratifying to one's feelings for the time, but on the whole, it would not pay. I have cured them of it, in various ways; sometimes by giving them some good fighting bees from another hive, and sometimes they got over it themselves after being shut up a while. I have tried scenting the robbers with some strong odor, like camphor or peppermint. Do this just at night, and by the next morning, the bees from each colony have an odor so distinct, that the sentinels have no trouble in telling their own bees from the others. This has seemed to answer, but as they might have been all right anyway, I am not quite certain that changing the scent was the cause of the cure. Contracting the entrance and closing all cracks and crevices are always very important in stopping robbers.

HOW TO KNOW ROBBER BEES.

It sometimes puzzles beginners exceedingly, to know whether the bees that come out are robbers, or the ordinary inmates of the hive.

A robber bee, when he approaches a hive, has a sly, guilty look, and flies with his legs spread in rather an unusual way, as if he wanted to be ready to use his heels as well as wings, if required. He will move cau-

tiously up to the entrance, and quickly dodge back, as soon as he sees a bee coming toward him. If he is promptly grabbed for, as soon as he attempts to go in, you need have but little fear. If a bee goes in and you cannot well tell whether he was a robber or not, you must keep a close watch on the bees that come out. This is a very sure way of telling when robbers have got a start, even at its first commencement. A bee, in going to the fields, comes out leisurely, and takes wing with but little trouble, because he has no load. His body is also slim, for he has no honey with him. A bee that has stolen a load, is generally very plump and full, and as he comes out, he has a hurried and guilty look; besides, he is almost always wiping his mouth, like a man who has just come out of a beer-shop. Most of all, he finds it a little difficult to take wing, as bees ordinarily do, because of the weight. In BEE HUNTING, I told you how a bee laden with thick undiluted honey, would stagger several times under his load, before he could take wing for his final trip home. Well, the bee when he comes out of the hive with the honey he has very likely just uncapped, feels instinctively that he will be quite apt to tumble unless he can take wing from some elevated position, and therefore he crawls up the side of the hive before he launches out. When he first takes wing, he falls a little by the weight of his load, before he has his wings fully under control, and therefore instead of starting out as a bee ordinarily does, he takes a downward curve, coming quite near the ground, before he rises safely and surely. With a little practice, you can tell a robber at a glance, by his way of coming out of the hive, particularly by that fashion of running up the side of the hive before taking wing, in the way I have mentioned.

HOW TO TELL WHERE THE ROBBER BEES LONG.

If you are a bee hunter, you will probably line them to their hive without any trouble, but if you are not, you can easily find from which hive they come, by sprinkling them with flour, as they come out of the hive being robbed. Now watch the other hives, and see where you find the floured bees going in. I can generally tell in a very few moments, by the excited actions of the robbers, already mentioned.

HOW TO STOP ROBBER BEES.

It depends a great deal on what particular stage of proceedings they have reached. If they are fighting briskly, and stinging one occasionally, they will usually take care of

themselves, if there are plenty of bees inside, and their entrance is contracted. I have known the robbers to get up so early on a cool morning that the regular inmates were not stirring, and before they were roused, and could put a stop to it, the robbers had quite a lively "trade" started. This is a bad fashion for an apiary to learn, but it will usually cure itself, if the colonies are all strong. If the bees are going in and out very rapidly, and running over the sentinels in a way indicating that they are overpowered, you must shut up the hive at once. Now be sure you shut it up so it will stay.⁶⁸ Putting blocks before the entrance is of but little use, for the united strength of the robbers will move quite a heavy weight. Sliding the hive back, as we do the Simplicity, is about the safest way which I know, of closing the entrance just as you want it, and having it stay. Now be sure you remember the caution I am going to give you in regard to this. Should the hive be standing in the sun, during a very hot day, and be full of bees, they would be very likely to smother, without a good deal of air.

If there are not many of them, there will be no danger of suffocation. It is the bees gorged with honey that are most apt to suffocate, for they are much like an individual who has eaten too large a dinner, and they cannot stand close confinement. When near suffocation, they will disgorge the honey, and the quantity is often sufficient to wet the whole mass almost as thoroughly, as if they had been dipped in honey. The heat given off by the damp crowd is often so great as to melt down the combs into a sticky mass, and when touched by the hand, it often feels almost scalding hot. The bees soon die in this condition, for their breathing pores are closed, and unless they can be speedily licked off by other bees, or washed, they will be "no good." If they are found in this condition, with life enough to move, they may be saved by giving them to clean bees to lick off, but they should be confined so that they cannot readily crawl out of the hive in the dirt; they will always do this if they can, for they seem to consider themselves of no use, and like any ailing bee, try to get off out of the way of those that are healthy and well. I have often saved almost every one, by dipping a teacupful, or even a pint, with a spoon, and placing them right over the frames of a strong colony. If you do not give each hive too many at once, they will soon clean them off as bright as themselves. Letting the outside robbers get at

the mass will do, but it may result in more trouble, unless you are master of your business. One of our feminine friends reported a short time ago, saving such a colony, by washing the bees in warm water, and then drying them in the sun, in a box covered with wire cloth.

There are several ways of preventing bees from smothering, when the hive is closed, and a very common one is to give them air, by means of an opening closed with wire cloth. Unless this is quite large, they will often pack so densely over it, as to exclude every particle of air, and thus defeat its purpose. If an upper story can be put on, and this covered with wire cloth, it will do very well, but even then the robbers inside make such a fuss as to call the robbers outside to them, and keep up a disturbance in the apiary all day. But a still worse objection is that the robbers will sometimes make an arrangement with those inside, by which they will pass the honey out, and thus clean out the hive, in time, as effectually as if they were allowed admittance. Our neighbor, Shaw, used a double wire cloth, with a half inch space between the sheets, for his small nucleus hives, just to prevent this kind of sharp practicing. I have several times seen bees pass honey through the wire cloth in this way, but have always stopped the fun, before the insiders had passed it all out. A correspondent in the Jan. GLEANINGS for 1879, gives an instance, where the whole of the honey was handed out to the robbers, leaving the insiders so destitute that they actually starved to death, the whole of them. These fellows, it seems, were a little too sharp, and in their greed for ill gotten gains, rather overstepped themselves.

Well, if we cannot give them ventilation through wire cloth, what shall we do? I would let the robbers out, without letting any of the outsiders in: I generally do this by brushing away, with a little bunch of asparagus tops, all the bees which are around the entrance, and then keeping them away until all get out that wish to. You can then close the hive with very little danger. If the colony is a large one (it is very seldom a large colony is caught being robbed), you would better shade the hive, to be on the safe side. It will also be a good idea to set on an upper story, and let them go up into that. If you have got the robbers all out, it will often do to give them their liberty the next morning, but if they will not defend themselves then, I would shut them up and let them remain 3 days. By this time, all the

bees that remained in the hive, or a large part of them, even if they are robbers, will adhere to the stand as if it had always been their own. I hardly know why this is, for a bee remembers things that happened several weeks before. Perhaps they get interested in the ways of their new home, and conclude to cast their lots there. I know that bees remember more than 3 days, because I once carried a stock away to a swamp and kept them there about a month. When I brought them back, I placed them on a new stand, and jostled them a little in opening the entrance. At this they sallied out in quite a body, but when they tried to return to their hive, they all went directly to their old stand. Bees have been known to do the same, after being in a bee house over winter.

After a colony has been confined a day or two, because they would not repel robbers, I would let them out just about sundown, and watch them closely. To be on the safe side, you would better get up next morning before they begin to fly, and see if they are all right.

It has been often recommended that the combs be broken and the honey set running in the robbers' hive, that they may be induced to stay at home; this will sometimes check them, but as these colonies are almost always extra spry and active, they will have things fixed up in a trice, and be out at their old trade again. In trying to people our house apiary, in the fall, when it was first built, I had a great deal of trouble with one certain colony. In fact, if any robbing was going on anywhere, it was sure to be these hybrids who were at the bottom of the mischief. After I had tried every plan I had heard recommended, and still these fellows would persist in pushing into every new colony I started, the idea occurred to me that, on the principle that it takes a rogue to catch a rogue, it would be well to try and see how they would repel robbers. I simply took the greater part of the combs from the robbers, bees and all, and carried them into the house apiary, and put them in place of the colony which they had been robbing. The effect was instantaneous. Every laden robber bee that came home with his load, on finding the queen and brood gone, at once showed the utmost consternation, and the passion for robbing was instantly changed to grief and moaning for the lost home. The weak colony which they had been robbing, and which had only a queen cell, was placed with them, and they soon took up with it, and went to work. The robbers newly dom-

iciled in the house apiary, repelled all invaders with such energy and determination, that the rest seemed to abandon the idea which they, doubtless, had previously formed, viz., that the house apiary was a monster hive but illy garrisoned, and I had but little trouble afterward. Before I swapped them, as I have mentioned, I had serious thoughts of destroying the queen, simply because they were such pests; but the year afterward, this colony gave me in the house apiary, over 100 lbs. of comb honey.

The practice of swapping colonies is not always a very safe one, on several accounts, although an experienced, or a careful hand, will often make it serve an excellent purpose. Sometimes the queen of the weaker colony may be attacked and destroyed, and again bees from other hives may strike in, and both being demoralized by the unexpected transition, and unfitted to repel intruders, robbing may be started on a much larger scale than before. Instead of exchanging hives and all, I think by far the better way is to leave the hives on their old stand, and simply exchange the greater part of the combs, with the bees adhering. With the fingers between each two combs, with both hands, we can raise four combs with all the adhering bees, and carry them all together. If done in this way, enough of the original inmates will be left in the strong hive to protect it, and enough will also be carried to the weaker hive to make it perfectly safe. The queen of the stronger hive will be in no danger, but the queen of the weaker one may have to be caged, although I have seldom found this necessary.

WHAT HAPPENS IF ROBBING IS NOT STOPPED.

Well, when the work is under real headway, the honey of a strong colony will disappear in from 2 to 12 hours; the bees will then starve in the hive, or go home with the pillagers, or scatter about and die.⁶⁹ This is not all; when the passion is fully aroused, they will not hesitate to attack the strongest stocks, and you will find your bees stung to death in heaps, before the entrances. This may, after a spell, put a stop to it, but I have seen them push ahead until every hive in the apiary was in an uproar, and it seemed as if every bee had gone crazy, sure. At such times, the robbers will attack passers by, in the streets, and even venture an attack on cats, dogs, aye, and hens and turkeys too. Like the American Indians when infuriated at the sight of blood, every bee seems to have a demoniacal delight in selling his life

by inflicting all the torments he possibly can, and feels sad because he cannot do any more mischief.

The account below, taken from page 224 of GLEANINGS for 1877, illustrates very vividly what I have tried to describe.

I send you a paper, the *Valley Herald*, published at our county seat, which has a little article on "Bees on a Rampage." I would be glad to hear your views on the subject. What caused those bees to act so, &c.?
JOHN W. HOODENPYLE.

Looney's Creek, Tenn., July 10, 1877.

BEEES ON A RAMPAGE.

Mr. Elisha Tate, who lives some fifteen miles from this place on the head of Battle Creek, met with quite a singular misfortune on the 19th inst. He has, or did have at that time, about twenty hives of bees, and on that day, while all were away from the house except a daughter and the baby, the bees became mad from some cause or other, left the hives in large swarms and commenced to sting every living thing on the place. They attacked the daughter, who fled from the house, leaving the babe on the bed. A fine jack was stung to death in the stable; all the chickens were killed, and a sheep, that was around the house, was stung so badly on the nose that that organ swelled to huge dimensions, causing death by suffocation. The cries of the daughter brought Mr. Tate to the house, and he proceeded to rescue his babe, which he found literally covered with bees; and we understand that it was with great difficulty that its life was saved. Mr. T. attempted to destroy the bees at night by piling fodder on the hives and setting fire to it, but it only served to again arouse them and they attacked the family and compelled them to abandon their house and go to a neighbor's.

No one can account for the strange occurrence. Some think that a snake must have visited the hives, as it is known that bees have the greatest antipathy toward snakes.

In all probability, the account is considerably exaggerated, as such things usually are before they get into the papers, but it affords an excellent lesson nevertheless on the results of letting bees get into a habit of robbing each other, or of finding honey scattered about the premises. I tried, in ANGER OF BEES, to illustrate it, but the above does it still better. The worst season seems to be after basswood is over, and the bees seem to get especially crazy, if they even get a smell of this aromatic honey left carelessly about the hives. One who has never seen such a state of affairs, can have but little idea of the furious way in which they sting everything and everybody. The remedy is to get a kettle of coals and put in enough chips or sawdust to make a "big smoke;" carry this out among the hives and proceed to close every hive that shows any symptoms of being robbed. Shut up every bit of honey where not a bee can get at it, and do your work well, for at such times they will wedge

into, and get through, cracks that would make one think *inch boards* were hardly protection enough. Just before dark, let all the robbers go home, and be up betimes next morning to see that all entrances are close and small, and that all the hives are bee tight. An experienced hand will restore peace and quietness in a very short time, in such a demoralized apiary. Black bees are much worse than Italians, for the latter will usually hold their stores against any number of assailants; good, strong, well made hives, filled with Italians, with plenty of brood in each, will be in little danger of any such "raids," although we have seen the wounded and slain piled up in heaps before robbers would desist and give up trying to force an entrance.

The love of honey, my friends, is by far more potent than "snakes" in demoralizing an apiary. I do not think bees have any particular enmity to them.⁷⁰

There is one more point; if in uncapping drone brood, or in cutting out brood to rear queens, you leave the cappings or bits of comb scattered about, the bees will get a taste of the milky fluid and juices of the brood, and it seems to craze them worse than honey even, if that is possible. Below is a letter illustrating it.

CROSS BEES.

I had some of the crossiest bees this summer that were ever heard of. They would fight the top of a stovepipe that runs up through a shed roof; there would be 50 or 100 bees at once, just whacking against that pipe, and very many fell into it and burned to death. They would dive into my smokepan, and burn up in that, and sting folks along the road. What the cause was I could not imagine, but at last I happened to think. I had been destroying drone brood, and when it was in a milky state I could not shake it out of the combs; the bees would eat it and it just made them crazy and ugly. Well, I always want to be sure about anything, so I left it off for awhile and they became peaceable again. On again giving them access to the milky brood, the same result followed. I suppose you will laugh, but I am well satisfied that this and this only, was the cause of the fierceness of the bees. D. GARDNER.

Carson City, Mich., Nov. 9, 1877.

PREVENTION OF ROBBING.

Beginners are very apt to say that the bees must rob some, that there is no such thing as preventing it absolutely. They say honey will get daubed about, on the door knobs, on the posts, and on the ground, and that it cannot be helped; that the bees will rob after the honey yield has ceased, for they will crowd into the hives when they are opened to cut out queen cells, etc. Is this so, my friends? To be sure it is not. You can have your honey house as clean as your

kitchen, and you can have every particle of honey cleaned up. You can have a wash basin and cloth, and just the moment a drop falls, you can, if you have a mind to, get right down on your knees and clean it up. You can not afford to take so much time? I verily believe it will take less time to have everything neat, and always in place, than it will to have such scenes of disorder. I could sit down and cry, many times, if I thought it would do any good, to see young people defeat themselves, and make themselves unhappy too, by their heedless, careless way of doing things. Is it because they have not been trained differently? Perhaps so, and perhaps experience is the best teacher. Experience is a very slow teacher, and I would like to stir you all up, and have you get along faster in habits of neatness, for I know you all admire a neat apiary nearly, if not quite, as much as I do.

A GREAT DISCOVERY.

I have often, when beset by robbers during some experiment I wanted to make in the fall of the year, longed for some place where I could carry a single hive, where it would be entirely free from bees of other hives. I first thought of some spot in the country, where there were no bees within a couple of miles, but as such a spot would be difficult to find here, I thought of a wire cloth house; but then, you know, the bees of my one hive would fly against the wires, and so that would not be free from difficulties either. I have before mentioned my troubles in trying to people the house apiary, in the fall. Queens were already hatched in the lamp nursery, and unless the colonies were divided at once, so as to make use of them, all would be lost. The surplus combs for making these late swarms were in the upper stories, and the robbers knew it; for no sooner was a cap raised than they were on hand, and before I could get the brood combs to go with them (I found that the bees would not adhere even to their own combs, unless some of them contained unsealed brood), a smart traffic would be under way. It came night, and my hives and queens were in all sorts of bad shapes. I was glad to have it come night, I assure you, for I longed for the time when the robbers would be compelled, by the gathering darkness, to go home. I presume many of you have had cause to repent trying to work with bees when it began to grow dark, but I got the idea into my head that, with some good lamps with nice shades on them, I could do my work in the evening. I went at once and

got a lamp, and walked around the apiary, viewing the inmates of the different hives, that were clustered out at the entrances, humming merrily, I presume in remembrance of the rich loads they had but an hour before snatched from me. Scarcely a bee took wing, and I then ventured to open a hive. With the lamp on one of the posts of the trellis, I found I could handle the bees almost as well as in daylight, and to my intense relief, not a bee would leave his hive, no matter how many combs were held temptingly under their very noses. I went to work, divided my hives, caught the queens, and even handled vicious hybrids, with less stings than I could possibly have got along with in the daytime. As I passed again and again the hives of the robbers who were clustered out viewing proceedings, I could hardly resist the temptation to place my thumb at the side of my nose, to let them know how much I enjoyed having completely outwitted them. The last hive in the house apiary was filled, unsealed brood and a queen cell given to all, and all were fixed so that they could repel robbers by morning, without trouble. Of course, I had a good smoker, and this did much towards preventing them from taking wing. If the lamps were placed very near the bees, occasionally a bee would buzz against the light, but when placed off at a distance of 6 or 8 feet, they rarely approached it. I have extracted honey, late in the fall, by moonlight, when it would have been impossible to do it in the daytime, on account of the robbers.

There is a kind of pillaging called borrowing, where the bees from one hive will go quietly into another, and carry away its stores as fast as gathered; but this usually happens where the robbed stock is queenless, or has an unfertile queen. As soon as they have eggs and brood, they begin to realize what the end of such work will be. This state of affairs seldom goes on a great while. It either results in downright robbing, or the bees themselves put a stop to it.

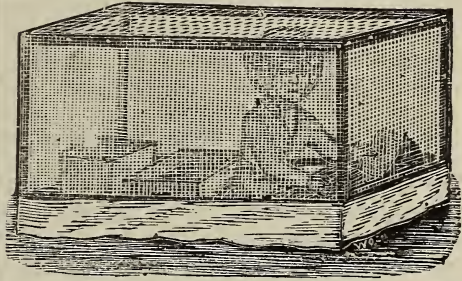
Caution to Beginners:—The first year I kept bees, I was in constant fear that they would get to robbing, as I had read so much about it in the books. One afternoon in May, I saw a large number of bees passing rapidly out and in, at a particular hive, and the more I examined them the more I was persuaded that they were being robbed. I contracted the entrance, but it seemed to make little difference; I finally closed it almost entirely, compelling the bees to squeeze out and in, in a way that must have been

quite uncomfortable, at least. After awhile, they calmed down, and we had only the ordinary number of bees going out and in. "There," thought I, "if I had not read the books and known how, I might have lost my bees," and I presume I felt very wise, if I did not look so. On turning my head, behold the robbers were at another colony, and they had to be put through the same programme; then another, and another; and I concluded a host of robbers had come from somewhere, and made a raid on my apiary, and that had I not been on hand, the whole of them would have been ruined. I had got very nervous and fidgetty, and when I found the whole performance repeated the next day, I began to think bee-culture a very trying pursuit. Well, in due course of time, I figured out that there was no robbing at all, but that it was just the young bees taking their afternoon play spell. Since then, I do not know how many of the A B C class have gone through the same, or a similar experience, and it is but a few days since I saw our minister and his wife out by a hive, closing it up, to stop the robbers that were making a raid on it. On my suggesting that they were mistaken, they replied, "Why, the air was full of them, and we could see them circling about away up in the air," proving conclusively to me, that it was the young bees playing, as I have said before. The directions I have given for distinguishing robbing bees from the ordinary inmates of the hive, will enable you to tell whether it is playing or robbing; but, as the books had not described the afternoon play spell that young bees always take in suitable weather, I was somewhat excusable.

HOW TO CIRCUMVENT ROBBERS, AND KEEP
RIGHT ON TRANSFERRING, RAISING
QUEENS, ETC.

During the summer of 1879 the basswood season failed us suddenly, about the 20th of July, and left us with some thing like 250 queen-rearing colonies. The bees very soon informed us which colonies would protect their entrance, and which would not; and by giving combs of unsealed larvæ to all that had no laying queens, and combs of hatching bees to all that were short of bees, we soon had every one "holding the fort." Now bees were coming in daily, and bees were going out daily. Queens and pounds of bees were ordered by every mail, and must go by first express, especially if we hoped to hold our customers, and so, even if robbers did incline to dip into every hive, business could not be stopped. I instructed the boys to make a wire-cloth house, to set

over a hive when they wanted to open it, and here it is.



WIRE-CLOTH HOUSE, FOR TRANSFERRING,
ETC., DURING A SCARCITY OF HONEY.

The house is 6 feet long, $3\frac{1}{2}$ feet wide, and $3\frac{1}{2}$ feet high. The operator is expected to sit on the seat illustrated elsewhere, and a movable shelf is fixed across one end, on which to do his work. A single sheet of painted wire cloth goes right around the building, and overhead.

To prevent bees from getting under the edge, a strip of cloth is tacked on, having a hem on the lower edge, in which is drawn a cheap iron chain. This holds every portion down tight to the ground, even though the surface may be uneven. The whole is so light that it can be easily moved from hive to hive, or tipped up at any side when the operator wishes to get out. About 8 yards of wire cloth are needed, at an expense of about \$3.00. The wood work well painted and the cloth and chain will cost about a dollar more. When you wish to fasten any colony into their hive without smothering them, just set your house over them, and they are out of the way.

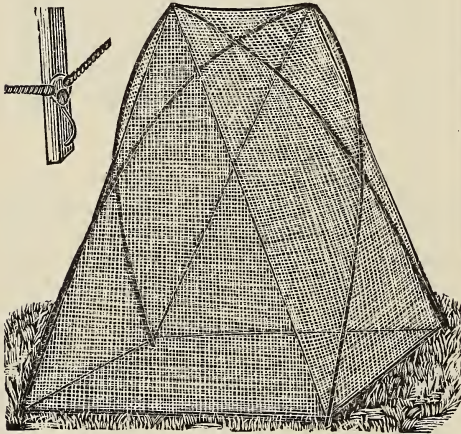
With this house you can open and examine any hive under any circumstances, no matter how bad the robbers are; and I should think it would pay for itself nearly every season in an apiary of twenty hives or more.

A FOLDING TENT FOR TRANSFERRING, ETC.

A cheaper, and much lighter to handle, though not as substantial a tent, may be made of mosquito-bar, instead of wire cloth, and our boys are now using these altogether during the present season of 1882.

It is made by taking four basswood sticks, about $8\frac{1}{2}$ feet long, and fastening them together like letter X's, with a good strong screw where they cross. A piece of good strong tarred twine, or small rope, makes the ridge-pole, as seen in the engraving, and this same twine unites the sticks at their tops. The mosquito bar is sewed into a sort of bag, having the same strong twine all

round its lower edges, and down each of the four corners. At these corners are also sewed metal rings, and these rings, when pulled down strongly, will loop over screw-heads, near the lower ends of the four sticks. When thus looped over, the sticks are bent, or bowed, so as to give room in the top of the tent. The whole structure weighs less than five pounds, and yet it gives room inside for a hive, and to do all necessary work. The basswood sticks are $1 \times \frac{3}{4}$ at the lower end, and tapered to $1 \times \frac{1}{2}$ at their upper end, with the corners taken off, to make them as light as possible. Where the bend comes, they are scraped a little thinner.



THE NEW FOLDING BEE-HIVE TENT.



THE SAME FOLDED UP.

In the small cut at the left is shown the way the ring is looped over the screw-heads, and just below is seen the end of a 24-inch wire nail, bent so it can be (when turned with the point downward) used as an anchor to keep the tent from blowing over. If the sticks are spread a little when the anchors are pushed into the ground, the tent stands very securely.

ROCKY MOUNTAIN BEE PLANT (*Cleome Integrifolia*). This is a beautiful plant for the flower garden, to say nothing of the honey it produces. It grows from two to three feet in height, and bears large clusters of bright pink flowers, as shown in the cut.

It is a near relative of the SPIDER PLANT, which see. It grows naturally on the Rocky Mountains, and in Colorado, where it is said to furnish large quantities of honey. Although it succeeds easily under cultivation,

in our locality, I cannot learn that it has ever been a success pecuniarily. With this, as well as with all other plants, it must be borne in mind that, to yield honey enough to give it a fair test, acres are needed, instead of little patches in the garden. The seed has been offered for sale for several years past, as a plant to be cultivated for honey; even if it does not pay for honey, it will pay to have a bed of it on account of its beauty.



ROCKY MOUNTAIN BEE PLANT.

The engraving was copied from a larger sized picture, in Prof. Cook's "Manual of the Apiary." During the past season of 1879, we have had a number of the plants growing in our honey-garden. It is, however, so much inferior in looks, as well as in the amount of honey produced, to the spider plant, that we have not taken pains to save the seed. The two plants very much resemble each other, but the latter is a much stronger and finer looking plant, and has a rank luxuriance of growth that the Rocky Mountain bee plant has not.

To have them do well in our gardens, that is, give us a good yield of honey, the seeds would better be planted in a box in-doors, say in February or March. Set them out when all danger of frost is past, and give them good, rich soil, with about the same cultivation you would give your cabbages. They should stand about as far apart as hills of corn. If you have many plants, it will be a good plan to cultivate them as you do field crops. It should be remembered the better

<p>the soil and cultivation, the better will be the yield of honey. These remarks will apply to either Rocky Mountain bee plant, Spider flower, or the Simpson honey plant. The</p>	<p>first two blossom the first year; the last, sparingly the first year, but abundantly the second year.</p>
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HEXAGONAL CALIFORNIA APIARY, BELONGING TO R. WILKIN, SAN BUENAVENTURA.

S.

SAGE (*Salvia*). This plant also belongs to the great family of *Labiatae*, or the mint family. Labiate means lip shaped; and if you look closely, you will see that plants belonging to this family have blossoms with a sort of lip on one side, something like the nose to a pitcher. Many of this family, such as CATNIP, MOTHERWORT, FIGWORT, GILL-OVER-THE-GROUND, have already been mentioned as honey plants, and the number might be extended almost indefinitely. The sage we have particularly to do with is the white mountain sage, of California; and I do not know that I should be far out of the way in calling this one of the most important honey plants in the world. The crops of honey secured from it within the past ten years have been so immense, that the sage honey is now offered for sale in almost all the principal cities in the world, and a nice sample of well-ripened California honey, whether comb or extracted, is enough to call forth exclamations of surprise and delight from any one who thinks enough of something good to eat, and pleasant to the taste, to commit themselves so far. I well remember the first taste I had of the mountain-sage honey. Mr. Langstroth was visiting me at the time, and his exclamations were much like my own, only that he declared it was almost identical in flavor with the famed honey of Hymettus, of which he had received a sample some years ago. Well, this honey of Hymettus, which has been celebrated both in poetry and prose for ages past, was gathered from the mountain thyme, and the botany tells us that thyme and sage not only belong to the same family, but are closely related. Therefore it is nothing strange, if Mr. Langstroth was right, in declaring our California honey to be almost, if not quite, identical in flavor with the honey of Hymettus. This species of sage grows along the sides of the mountain, and blossoms successively, as the season advances; that is, the bees first commence work on it in the valleys, and then gradually fly higher up, as the

blossoms climb the mountain side, giving them a much longer season than we have in regions not mountainous.

There are several varieties of mountain sage, and there has been some discussion as to which one furnishes the largest amount and the finest honey. The one figured below was sent us by a friend in California, who assures us it is the veritable mountain sage, and produces the celebrated honey that has made California famous.



CALIFORNIA WHITE MOUNTAIN SAGE.

One striking peculiarity of this honey is, that it does not candy, but remains limpid, during the severest winter weather. I have taken a sample so thick that the tumbler containing it might be turned bottom upward without its running at all, and placed it out in the snow, in the dead of winter, and failed to crystallize it. This is a very valuable quality of it, if it is invariably the case; for we all know full well, that the candying tendency is a great drawback to the sale of extracted honey. I presume the honey should be fully ripened in the hive, to have it possess this property, as it is well known that perfectly ripened clover honey will often

possess this same property here, while un-ripened honey, of any kind, is much disposed to candy at the approach of cool weather. I believe some effort has been made to cultivate this plant; perhaps a soil that raises pennyroyal naturally, would suit it, as they are nearly allied, and I have been told that pennyroyal yields considerable quantities of honey, on the waste lands of Kelley's island, in Lake Erie.

It has been said, that one soon tires of this beautiful aromatic flavor of the mountain sage, and that, for a steady diet, the white clover honey of the Western Reserve far out-rivals it. This may be so; for, as a general thing, I believe people usually tire of these strong and distinct flavors in honey, like those of basswood and mountain sage. For all that, dear reader, if you have never tasted mountain sage honey, and are a lover of honey, there is a rich treat in store for you, when you do come across some.

Since I have been writing about the sage, I have concluded to have a bed of it on my honey farm, where it will be a curiosity to visitors, even if it does not yield honey here as it does in California. Now let us see who will have the nicest flower garden of honey plants. Not a patch all choked up with weeds, and scattered about in wild disorder, but a real pretty little garden. You can roll up your sleeves and set to work at it this very minute, if you wish.

SMOKERS. We can drive cattle and horses, and, to some extent, drive even pigs, with a whip, but one who undertakes to drive bees in any such way will find to his sorrow, that all the rest of the animal kingdom are mild in comparison, especially as far as stubbornness and fearlessness of consequences are concerned. You may kill them by the thousand, you may even burn them up with fire, but the death agonies of their comrades seem only to provoke them to new fury, and they push on to the combat with a relentlessness which I can compare to nothing better than to a nest of yellow jackets that have made up their minds to die, and to make all the mischief they possibly can before dying.⁷¹ It is here that the power of smoke comes in; and to one who is not conversant with its use, it seems simply astonishing to see them turn about and retreat in the most perfect dismay and fright, from the effects of a puff or two of smoke, from a mere fragment of rotten wood. What would we bee-keepers do with bees at times, were no such potent power as smoke known?

A great many colonies of bees, common as well as Italian, can be handled almost the season round without smoke, while there are others that it would be almost madness to attempt to handle in the same way. With a little practice, we can decide before going far enough to get stung, whether it will be safe to attempt handling them without smoke.

When away from home, if I have occasion to handle a colony, I test their gentleness, by proceeding to open the hive as carefully as possible. If they rush out in a great body as soon as an opening is made, I wait a little to see if they will go back soon; if they do not, but show a disposition to fight, I hunt up a couple of pieces of rotten wood, and get a coal of fire to put between them. With this, smoke can be blown on them, until they are driven out of the way, down among the combs. If a coal of fire is not handy, light the wood with a match, but it takes more time to get it going. If compelled to use a match, a roll of cotton rags is very convenient, as it lights quickly. If it is carefully extinguished as soon as done with, a roll of rags will do very well for a small number of hives. With a large apiary, rotten wood, chips, or sawdust, is much cheaper than the rags, and to use them conveniently a pan or kettle is often used. Several of our neighbors who keep bees largely, use such a kettle with a long bail, fixed so that it always stands upright, that the operator may not be obliged to stoop every time he wishes to pick it up. In the kettle, are put chips, sticks, sawdust, &c., and when it is once started, it will keep burning for a whole day. If it burns too strongly, some damp sawdust is thrown on, and when not in use, the fire smoulders invisibly. When smoke is wanted, the kettle is given a shake by the bail, and at once a dense smoke arises. If this smoking kettle is placed at the proper side of the hive, the wind will throw the smoke where wanted, leaving both hands at liberty. Where robbers are bad, this is a very convenient arrangement, for it not only keeps the bees in the hive in subjection, but keeps the angry bees flying about in the air at bay.

I presume there are many who will use this kind of smoker in preference to any other. The objections are, that one is pretty apt to have smoke blown in his eyes very inopportunistically, and I, for one, would almost as soon be stung, as to be smoked. Another is, that bees frequently fall into the kettle, and the sight of one heavily laden little fel-

low writhing in death agonies on the burning embers, would be enough of a lesson for me. At one time, a queen fell into our kettle, and was only by rare good luck rescued. To prevent such mishaps, I thought of a wire cloth cover for the kettle, and as I had been using with good satisfaction, a small saucepan with a handle, in place of a kettle, it did not take very long to decide that a common corn-popper was just about what was wanted.

CORN-POPPER SMOKER.

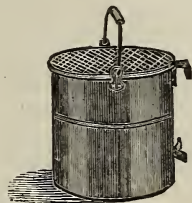
This, when tried, proved to be in many respects very convenient, for it could easily be started burning briskly by whirling the whole about the head, like a torch, and the ashes fell out of themselves. For awhile, we thought we should want nothing better. The difficulty, however, with this, was that it would often give too much smoke; it smoked the eyes, and it burned so rapidly, that it was quite a task to provide fuel. It is true that it never annoyed us by going out as did the bellows smokers, but, on the other hand, it did not offer the same facilities for throwing a jet of smoke down into the hive, or into any particular corner. With all the good points of the corn-popper, it was finally laid aside for the Quinby smoker again, even if it did try our patience sorely by going out whenever it was allowed to tumble over, and many times when it did not tumble over at all. The Bingham smoker came a little nearer to the kettle and corn-popper, in having a much larger receptacle for the fuel, and as one of the valves that Quinby used is dispensed with, it is not very likely to go out, unless it is overturned.

Although there are some who prefer a simple tin tube with a wooden plug in each end, to be held in the mouth, the majority of our bee-keepers seem to be strongly in favor of the bellows smoker, and after trying to learn to like one, I find myself much like the rest. I should, of course, much prefer a mouth smoker to none at all. There is one point in its favor; it can be held in the mouth so that both hands are at liberty, but one that can be set on the ground so the wind carries the smoke over the hive, I think preferable.

TOWNLEY'S SMOKER.

All bellows smokers that I have used are objectionable in this respect, that when handling cross swarms of hybrid bees, they require an extra hand, or else the operator must use the bellows with one hand while he works with the other. For several years past, I have used an ash pail, setting it on a stand just high enough so that the wind would blow the smoke over the top of the hive; but as the hives

were not all the same height, it was necessary to have several stands to correspond with the height of the hives. I now use a pail made expressly for the purpose, which will be readily understood by the following cut:



TOWNLEY'S SMOKER.

Eight inches in diameter, by ten inches high is large enough. It is made of sheet iron, with the handle riveted on. The hook at the top is two inches long, so that, when hooked onto a hive, there will be the space of an inch between the smoker and hive, while the curved piece of sheet iron, the centre of which is riveted to the side of the smoker, near the bottom, will keep that part also away from the hive. Enough dry peat, or "marsh muck," or coarse, damp saw dust, or fine, damp chips, can be put into it, with some fire, to keep it smoking half a day at a time, and it is always ready for use. All that is necessary is to hang it on the windward side of the hive, stand on the opposite side, and go right to work.

J. H. TOWNLEY.

Tompkins, Jackson Co., Mich.

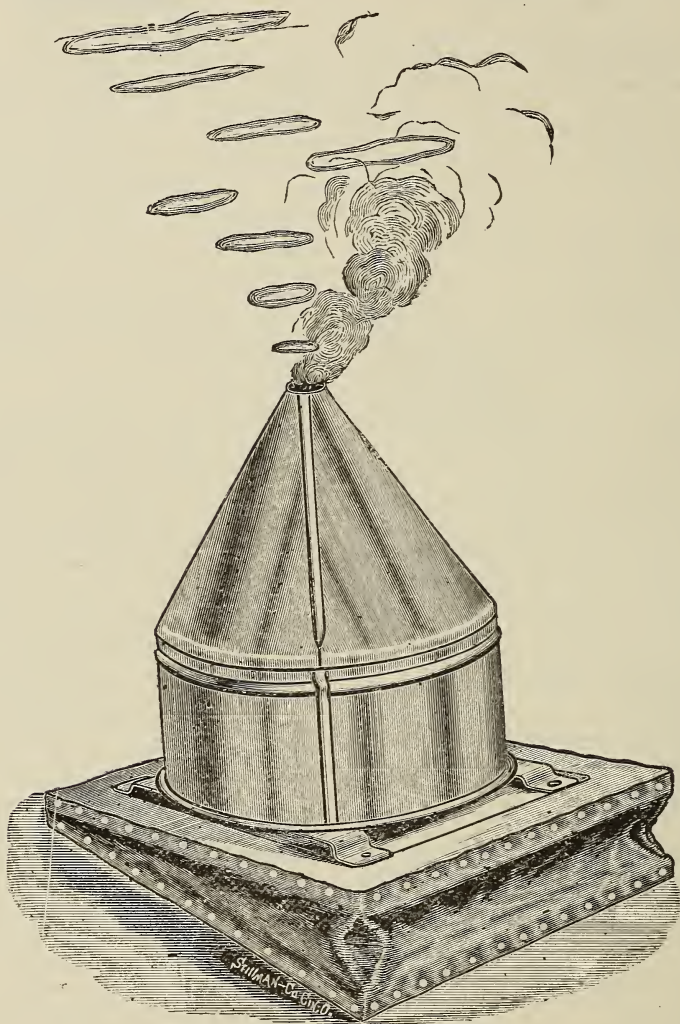
I have many times noticed the same objection to the bellows smokers that is mentioned by friend Townley, and this is one reason why I have made the fire pot of ours large, so that it might be placed on one corner of the hive, and keep a small cloud of smoke in the air, over the hive. One great objection to an open fire pot is that bees often fall into the fire; and to obviate this, I have taken the liberty to add a wire cloth cover to the Townley smoker, as seen in the cut. To make the implement lighter, I would have it made of tin, instead of sheet iron, and if it is kept somewhere out of the rain, as, of course, it always should be in any case, it will keep nice, and last a long while. The greatest objection to these smokers is, as has been mentioned, that one's eyes are always liable to be smoked in a way that is, to me, more annoying than an occasional sting; for the wind is rarely so accommodating as to blow the smoke just where wanted, and no where else. For all this, I presume there are many of you, who will prefer such a smoker to any other kind.

FUEL FOR SMOKERS.

Perhaps rags work as nicely as anything, but as it would require a great many, for the wants of a large apiary, we must hunt up something cheaper. If we go out in the woods during a dry time, we can find rotten wood by taking some care and pains, that

will ignite readily with a match, and keep burning. This is quite desirable for the smokers with a small narrow tube, but not so much so with those of a larger capacity for fuel, as it burns out almost too rapidly. For the latter, common stove wood cut into short pieces and split up, does very well. When some of the little folks are wanting something to do, you can show them how, and have a large basketful cut up and kept in readiness, in some dry place. The sound

kers, and as it lights readily with a match, and makes a great quantity of smoke, I am inclined to think we shall find nothing better. It is very light, can be cheaply shipped, and makes but a very small amount of ashes. I would advise those who have peat swamps near them, to make a trial of it. It takes quite a time to dry thoroughly, which is the reason we did not discover its valuable properties sooner; if cut into thin slices, it would probably dry much sooner.



THE SIMPLICITY SMOKER.

hard wood, will last much longer than the rotten wood. A couple of years ago, a friend sent us a box of a mossy substance, which I suppose to be peat from the swamps, but as it did not burn very readily then, it was laid aside and forgotten. This summer, however, I found our boys using it in their smo-

You will observe from the cut above, that we have in reality retained the kettle idea, but the smoker is small and made of tin. To prevent its being overturned, we have given it a large base, like an oiler; it is in fact, something like the Irishman's wall, four feet high, and six feet thick, so that if

it ever falls down, it will be higher than before.

The shape of the upper part, or funnel, is such that there is very little danger of any fire getting out, even if no wire cloth is used over the mouth, and if you first give it a puff to dislodge any loose matter, there will be very little chance of blowing ashes or fire among the bees.

One of the greatest objections to using burning rags, rotten wood, or anything else, in the hand, or in an open dish, is that sparks may get on the quilt, in the sawdust, or where they may do harm about the apiary. A visitor once showed me how I could use a piece of rotten wood in my hand, and in less than 24 hours, I got the sawdust on fire, and burned up one of my best colonies. During dry hot summer weather, it behooves us to be very careful.

Now aside from its good qualities for subduing bees, this smoker is a most excellent device for entertaining children. If you hold it by the upper board, and tap lightly on the under one, it will send out the beautiful revolving rings of smoke, that our artist has attempted to picture. When making the machine, I had no idea of producing this well-known philosophical curiosity, and upon setting down, a little hastily, the first one made, the spinning ring that ascended, enlarging as it went up, forcibly reminded me of the genii of old, who came out of the copper cup.

The above was written in 1877, and the engraving made of the Simplicity smoker as it then appeared. During the year 1879, Mr. J. G. Corey, Santa Paula, Cal., and Norman Clark, of Sterling, Ills., each without the knowledge of the other, made important improvements, on one and the same principle; viz., blowing on the bees, cold air charged with smoke, instead of hot air. These improvements are what has been called the cold blast arrangement. I will describe the two forms as they are made at this time.

HOW TO MAKE A COLD-BLAST SMOKER.

Both kinds are made of two sizes. The boards for the bellows of the common size are 4 by 5½ inches; for the large size, 5 by 6 inches. The thickness is about ¾, or as thick as you can plane them up nicely when two are got out of an inch board. The lumber usually preferred is basswood, because it is light, and not apt to split. Where smokers are to be made by the quantity, I would cut the inch boards into lengths of 6 or 8 ft., split them up 4 or 5 in. wide, as the case may be, split them edgewise, and plane the pieces on

both sides. We put them in bundles precisely as we do the stuff for our section boxes, using the same iron clamps. Before clamping them, however, a groove is to be plowed in half of the boards, to hold the spring for opening the bellows. This groove is exactly in the middle, ¾ in. wide and 1-16 in. deep. When clamped, bolts are to be cut off (as in making sections) with a saw large enough to go through. If no such saw is at hand, they may be cut in from each side. After the bolts are cut, a corner is to be taken off as shown in the cut below.



BOARDS FOR SMOKER BELLOWES.

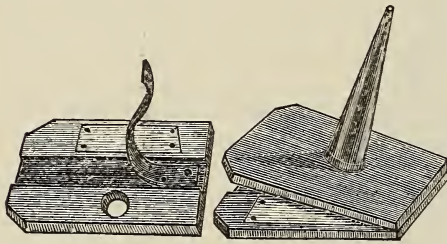
This corner is taken off, that we may have the leather all bulge outward, when the boards are closed together; that is, we wish the whole to be so made that the boards may be pressed tight against each other, expelling every bit of the air, the spring being made to lie in a groove for this purpose. When the corners of the bolts are off, the whole bolt is to be nicely sand-papered, and the edges of the boards planed, so that each board is finished nicely when taken out of the clamp. Just half of the boards are to have an inch hole bored in them, to put in the blast tube, and the other half are to have ¾ holes for the two valves, to admit air. By far the cheapest way to bore these holes is while the boards are clamped together. Have a long bit that will bore clean and smooth, and decide, by measuring, when it is through just half the boards. In this way, it takes but little time to get the boards ready for a thousand smokers, for they are never handled singly at all.

For the leather, you want some soft, smooth, sheep skin, and the piece needed for the medium size is 19 in. long, by 2½ wide, in the middle, and gradually tapers to only ¾ in. in width, at each end. For the large bellows, the length is 23 in., the width, in the middle, 3 in., and ¾ at the ends. You will also want some strips 1 in. wide, and as long as these pieces, for a binding, when the leather is tacked to the boards. The whole of the leather for a smoker should not cost to exceed 10c, for we can get a whole piece large enough to make 8 or 10 smokers for only 75c. To have the leather bulge outward, as I have before explained, it should be stretched in the middle, and pressed outward before being tacked on, and when the bellows is first closed, the leather must be

pulled out; when once it gets the habit of folding right, it will do so ever afterward. Besides the tacks, the leather should be fastened to the wood with glue, to get an air tight joint.

The valves are simply pieces of soft leather tacked over the holes; for a $\frac{3}{4}$ hole, you want a piece of leather about $1\frac{1}{2}$ by $3\frac{1}{2}$, putting a tack in each corner. In making bellows, there will be fragments of leather left, that will do for nothing else. For the Clark smoker shown on next page, we use a single valve over a $1\frac{1}{2}$ -inch hole.

The blast tube is made of tin, tapering like the spout to an oil can. It is made just as large, at the large end, as it can be, and be driven into the board; $\frac{1}{2}$ inch from the end, a rib is raised, to prevent its being driven in too far, and the inside is then burnished down hard and close to the wood, making it firm and air tight. The short tube in the cone is made and attached to the cone, in much the same way.



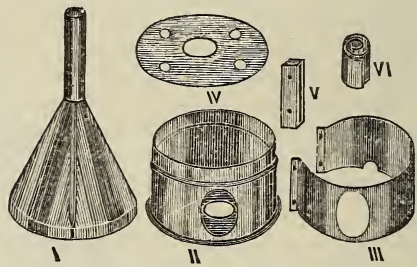
MAKING THE BELLWS.

The springs shown in the figure above, are made of bits of clock spring, to be had of any jeweler. You can get a whole clock spring for 20c., which will make 6 smoker springs. Bend the springs to the shape shown in the cut, and rivet the end to the wood, by two secure rivets. Steel springs sometimes break, it is true, and you can use similar ones made of brass if you choose; these never break, but they almost always lose their elasticity sooner or later. For my own use, I prefer the light springs called alarm springs, because they are softer, and it is easier to work the bellows. As others generally prefer a stiff spring, those we sell are made that way. Bend your springs so that the boards will come up promptly, as far as the leather will allow. To make a neat job, you should put on the leather with wire nails, about five-eighths in length. Put the boards closely together at the end where the hinge is, and tack one end of your long piece of leather. The boards should be separated at the other ends, as far as the width of the

leather will allow. Draw the leather close up to the wood, and tack at intervals. Now tack the $\frac{1}{2}$ inch strip on for a binding; if you wish a pretty job, use red morocco for this last. When your tacks are all in—I would drive them a little more than $\frac{1}{2}$ inch apart—you are ready to pare off the surplus leather with a very sharp knife. Finish off everything neatly with sandpaper, and your bellows is done. The leather has cost us 10c., the two boards, possibly 5c., and the spring 5 more. Allowing 5c. for your time in tacking on the leather and sand-papering, and you have a good bellows for 25c. For this price, it should be as good as anything in the market.

The tin cup shown below, is 4 inches in diameter, and $2\frac{1}{2}$ high, and the nozzle is made to shut closely over it. I prefer about a $\frac{1}{2}$ inch tube for the exit of smoke.

Now I take considerable pride in telling you how I attach the whole to the bellows, damper and all, for I consider it quite an invention in the way of cheapness, strength and simplicity.



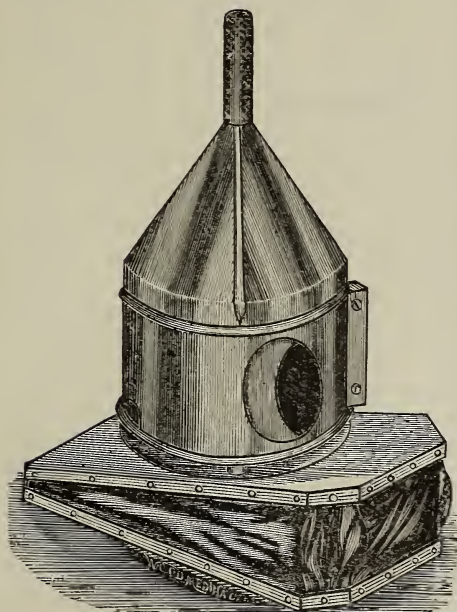
SMOKER "DISSECTED."

Fig. 4 represents the bottom of the smoker cup. The large hole in the center is to allow the blast tube to come up through, and the smaller ones are for 4 common screws that attach it to the bellows.

Now we cannot screw the fire receptacle directly on to the wood, because it would burn it; but I have found by experiment that 1-4 inch space between the bottom and the wood is all that is needed, if the wood is first covered with a sheet of tin. Accordingly, we cut another plain piece of tin, exactly like Fig. 4, holes and all; between the two, we put short tin tubes, made by rolling up short strips 1-4 inch wide. These short tubes, shown at Fig. 6, are made so that a screw will just go through them.

With the old Simplicity smokers, much complaint has been made about burned fingers, when getting the top off to replenish the fuel. You will observe in this that we have made a door, with a slide to close it,

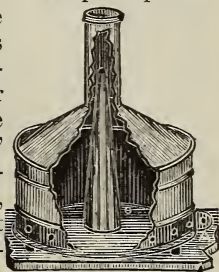
and this slide also opens and closes the damper. It is simply a ring of tin, surrounding the first receptacle, having a wooden handle to turn it by. Should this ring ever turn too hard, the screws may be taken from the handle, and a piece of pasteboard inserted so as to make it a little larger.



SIMPLICITY COLD-BLAST SMOKER.

The tin cup will probably cost you, at a tinsmith's, about 5c., and the funnel probably as much more. The damper, short tubes, etc., will cost about another 5c., and this will make your smoker, complete, cost about 40 cents. Good strong boxes for mailing will cost about 5c., and this leaves us 5c. profit on each when they are sold by the dozen. Any dealer in bee-keeping supplies should be able to make them at the above estimate, and if machinery is employed, they may be made for a less amount.

The action of the cold blast principle will be made plain by the cut opposite, which was made from Corey's original cold blast smoker as it was sent me. The blast, in passing thro' the larger tube that encloses the blast tube, draws the air with it from the fire receptacle; this, of course, produces a partial vacuum, and causes the outer air to rush in through the holes in and about the damper. The blast, as you will observe, is all cold air, and the smoke is brought up and mixed with it in the way I have mentioned. The draft is sufficient to burn any fuel that is properly dried, full as rapidly as it is desirable to have it burn. The principle of this cold blast idea is precisely the same as that of the little implement known as a perfume atomizer, or spray diffuser, the current of air drawing either air or liquids after it.

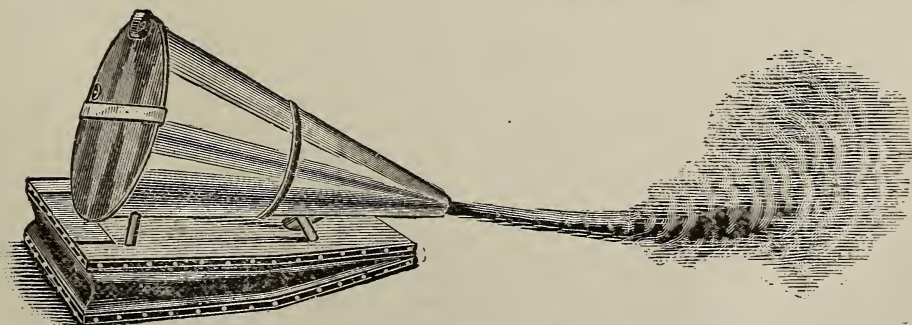


ORIGINAL COLD BLAST.

Clark's cold-blast smoker, of which we give an engraving next, is made on the same principle, with a little different modification of the parts.

This differs from the Simplicity, in having a fire pot made of a single piece of tin, with tapering sides, like an oil can. The engraving given below will make the tin work plain to any tinsmith. The bellows is essentially the same as the Simplicity except that the hole for the blast is near to one end.

The blast of air is brought through the curved tube ending near the point of the cone. This curved tube, shown slightly in the cut, is exactly the kind used for oil can spouts. To prevent coals from clogging the cone, a circular piece of tin with $\frac{3}{8}$ perforators, is snapped in where the bead is seen, just back of this tube. The fire-pot is attached to the bellows by four screws pass-



CLARK'S COLD-BLAST SMOKER.

ing through the rolled up tin tubes described on page 214. Both are put together with screws, in such a way that they can easily be taken to pieces for repairs, or for renewing the different portions, if need be. The smoker last described being cheapest made, because the fire-pot (except the bottom) is of one single piece of tin, is now (Sept., 1882) the only one we make and keep in stock. It is also giving by far the best satisfaction.

HOW TO USE THE COLD BLAST SMOKER.

Get some dry rotten wood, something that you can break up easily with the hands, and that is sufficiently dry to be lighted easily with a match. Fill the smoker full of wood broken up moderately fine, especially that portion of it that is put in around the door. Close the door nearly down to its place, so as to have only a small draft-hole open. Now light your match on the strip of sand-paper pasted on the bellows near the mouth of the fire-pot, and when it gets well burning hold it before the fuel. The blaze of the match will not go in and light the wood, of course; but if you work the bellows while keeping the match there the blaze will shoot in and ignite the rotten wood in a twinkling. Keep blowing for a minute, and I think you will be satisfied with the amount of smoke. When you want the smoker to go out, turn the door so as to close the damper. It should never go out otherwise, if it is in proper order, and your fuel right.

If you wish to burn rags, make them into a long roll, something like a sausage—I beg pardon for the comparison—a slim bag, stuffed with refuse rags such as you can buy at the stores for a cent a lb. Coil this roll of rags around the smoker inside, in a sort of corkscrew shape, so that no fold touches the next, the lower end coming just before the draft-hole; it will now burn slowly until all is consumed, or until the draft is turned. If you let one fold strike the next, it will give more smoke, but of course will not burn so long. The cone will, in time, get filled up with soot, and to have the smoker burn freely, this must be cleaned out when necessary. It is easily removed, with a stick of the proper shape. If you want a great quantity of smoke, when you set your smoker down, set it so the wind will blow in at the draft; ordinarily I should turn it from the wind, to save the fuel. The circular grate can easily be pushed out, when you wish to clean out the soot. Give the smoker a good shake, and blow out the ashes before you direct it into the hive.

Judging from experience, I think it will be a good idea to go out into the woods with a wagon, and get a good lot of nice rotten wood. To rotten elm we rather give the preference. If you haven't a place where you can keep it dry, build a small house on purpose for it. Lay it out in the hot sun, until it is perfectly dry, or dry it in an oven. After you have got it dry, do not leave it out in the rain. If you are awfully careless, get your wife to help you to remember.

SOLDERING. About 20 years ago—is it possible that it is really so long?—there appeared in the *Scientific American*, and several other papers, an advertisement headed “Mend Your Own Tinware,” and to the effect that the implements, with full printed instructions, would be sent by mail, for 30c.

The signature to the advertisement was Amos I. Root & Co., Medina, O. The Amos I. Root was myself, but the “Co.” only existed in my fertile but, I fear, unscrupulous brain. Many 30 “centses” were sent, and I drove quite a thriving business, for a boy of only 18; I believe the implements generally gave good satisfaction, and I should look back at the enterprise with some degree of pride, were it not for that unfortunate propensity of desiring that the world should think me greater than I really was, which then prompted me to think I needed to say “Co.,” to induce people to invest.

It was just about this time that the *American Agriculturist* began to do a thriving business exposing humbugs and swindles, and the first I knew, they had my soldering implements held up to view. My little soldering iron, or brass rather, they laughed at, and without even reading the printed directions, they pronounced the little metal case of chloride of zinc, with the few strips of solder, entirely worthless for mending tin ware; and so I dropped that speculation, not however, without something of a protest that I was right, and they wrong. We should be *very* careful about consigning things to the humbug and swindle department too hastily. I am inclined to think some good resulted, at all events; for very soon after, they got up some soldering implements of their own, which they sold for \$1.00. They gave a full sized soldering copper, a box of rosin, and quite a bar of solder. As bee-keepers find a great many uses for tin and tin work about the apiary, it has occurred to me, that I might get up a little “kit of tools” that would help you a great deal, or rather might tell you how to get up your own. Well, here we are, ready to talk about soldering.

A 1 lb. soldering copper will cost you about 35c., and a handle for the same, perhaps 10c. It may not be in order when received, and to put it in working trim will be your first job. File each of the four sides bright and smooth, and either with file or hammer, make a nice sharp point to the tool. Soldering irons, like lead pencils and a great many other things, should be kept sharp, to do good work. Get a piece of brick, some solder, and some rosin. Heat your iron hot, but not red hot, and rub it in the rosin and brick dust. This should be placed in a small cavity, in a piece of wood. If you rub the point of the iron hard against the wood, the brick will scour it bright, and the rosin will coat it so that no air can oxidize the copper. If you now melt a little from your bar of solder, in the cavity in the wood, it will readily unite with the copper and cover the surface as if it were dipped in quicksilver. When it is tinned all over, it is in working trim. Every time you forget and let the iron get red hot, it will burn the solder off, and it must be tinned over again, in the same way.

If you wish to solder on bright tin, you have only to fasten the pieces securely where you want them, and then just solder it. If you look at a tin-smith you will think it is just as easy as can be, to make the bright melted tin run down the joint so smoothly that it looks like one continuous piece, but when your own inexperienced hands undertake the task—oh dear! oh dear! You are awkward, without doubt, but perhaps the greatest trouble is that you have not all the necessary appliances at hand. To do a nice job, and do it conveniently, you will want a soldering board, something like this:



SOLDERING BOARD.

It should be about 12x18 inches, and the sides about an inch high. The two staples are for resting your iron, to prevent its burning the wood when not in use, and for holding the bars of solder, when the iron is touched to them. On the right hand, a bar of solder is shown, ready for use. You can never do anything with your solder laid flat on a board. On the left, are two little boxes; one is to hold a wet rag, on which the iron is to be wiped every time you take it from the fire, that we may have a bright clean surface. The other is to hold the powdered rosin; and if you wish to work with satis-

faction, I would advise you not to get the rosin on your fingers or clothes. For a brush for applying the rosin, draw some candle wicking into a tin tube. You can do a cleaner job by having the rosin mixed with oil, for all that is left after soldering may be wiped off with a soft cloth. Our girls use the rosin and oil for making the inside work to extractors. The ability to do smooth nice work, and do it rapidly, comes by practice.

Below, I give you a cut of the soldering iron, the bar of solder, the box of rosin, and the printed directions, such as are sent by mail for \$1.00. Common solder is worth about 15c. per lb., but for fine nice work, we use a larger proportion of tin. About equal parts of lead and tin, is the general rule.



SOLDERING IRON AND IMPLEMENTS.

You will probably get along very well with bright new tin, but when you come to try repairing, or mending old breaks where the metals are old and rusty, much more skill will be required to make a strong job. You will also find that something more than rosin is needed for iron, brass, and copper, and for rusty tinware. This was where my soldering implements came in, years ago. I got hold of the idea in this way. One dull day in the winter, a stranger called, asking if we had any tinware we would like repaired, *free of charge*. You may be sure that he and I were friends at once, and we gathered up the tin pans, and set him at work. He took a pretty little camphene lamp out of his pocket, then a bottle of some liquid, next an old file, and some little lumps of solder. A pan had a hole in the bottom: he scraped around the hole with his file, then punched the hole a little larger so as to raise a slight burr, held the place over the lamp, wet the metal with the liquid and dropped on a bit of solder which melted and filled up the hole in a twinkling; then another, and another, until all were done.

"How much for your work?"

"Nothing."

"Nothing? But what *do* you want us to do?"

"Buy that little bottle of soldering fluid."

"For how much?"

"Twenty-five cents."

I put down the money very quickly, and he prepared to go. But I was full of ques-

tions about the contents of that bottle. I was chemist enough, and Yankee enough, to make him own up, before he got out of the gate, that it was nothing but sal ammoniac and chloride of zinc, in solution. In return, he made me promise not to sell any of it inside of our county, under one year. The next week found me in a neighboring county mending tinware, *gratis*, and before Saturday night, I was back with between \$10. and \$12. clear profit, which was quite a speculation in those days. To make this wonderful soldering fluid which will cause the solder to flow on copper, zinc, iron or brass, you are to get $\frac{1}{2}$ of a lb. of muriatic acid, of a druggist, set it in a glass jar or tumbler, out of doors, and slowly drop in pieces of zinc, until it will "eat" no more. Dissolve 2 oz. of sal ammoniac in a glass of water, and add this to the acid and zinc. Strain the liquid into a glass bottle, and keep it out of the way of the children. When you mend the tinware for "nothing," a half oz. bottle of it is sold for 25c. Keep it off your clothes, and especially off your tools, for it rusts every thing badly. When you solder anything with it, carefully wash the article in clean water or rub it off well with a wet cloth. If iron or steel, finish off with some oil on a cloth. If you are careless with such things, you would better let it alone entirely. Always use rosin when you can make it work, as the fluid destroys the tinning on the soldering iron, very rapidly. To show you what you can do with these simple tools, I will state that the Hains feeder, shown on page 88, is easily made by one who is taking his first lessons in the art of soldering.

SOURWOOD (*Oxydendrum Arboreum*.)

This is considered a great honey bearing tree, in some localities, especially, in the South; but as I have had no personal experience with it, I submit a description from one of our friends who has furnished us with the specimen of the leaves and flowers, from which our engraving was made.

The Sourwood, sometimes called the Sorrel, is a fine tree from 40 to 60 feet in height, and about a foot in diameter; although it sometimes reaches 70 feet in height and a foot and a half through. The popular name, Sourwood, is derived from the odor and the peculiar sour taste of the leaves and small twigs.

It is entirely distinct from the black-gum and sour-gum or pepperidge, with which it has been unwittingly classed by some writers on honey plants, much to the injury of Sourwood. The former are honey producers to a small extent, but are not worthy to be compared with Sourwood, which, we are convinced after living where basswood, poplar, clover, buckwheat, golden rod, persimmon, and

aster abound, has not its superior among the honey producing plants of America, either in the amount of yield, or in its beautiful appearance. Basswood is more important only because of its widely extended growth. We write this article, to call attention more directly to this tree as a honey producer. Bee-masters are familiar with other flora which abound where those who have written our books on bee culture reside, yet few are aware of the merits of Sourwood, outside of the regions where it is found.



SOURWOOD LEAF, FLOWERS, AND SEED PODS.

We are not familiar with the extent of its growth, but know this much: it abounds in the native forests from southern Pennsylvania into Georgia and Mississippi. It seems to be more abundant along the whole mountainous tract of country on both sides of the Alleghanies and the Blue Ridge, reaching, in places, even as far as the tide water on one side, and to central Tennessee on the other. In many sections where poplar abounds and much buckwheat is raised, Sourwood is considered the *honey plant*, and yields the largest amount of surplus honey. It seems to flourish best on high, dry soil, and often abounds on poor woodland ridges, which can be purchased at a nominal price; though the forests along the rivers, in rich cultivated soil, are often beautifully checkered with the white blossoms in July. Being a tree, the growth is tall and generally spare of branches along the trunk, except when it grows in the edges of fields, where it yields the greatest amount of honey. The trunk preserves its uniformity of size for some distance up from the ground. The wood is white, with straight grain, which splits nicely. It is brittle and quite fine grained, and is used for posts by cabinet makers.

The flowers (see engraving) are produced on spikes five or six inches long, which hang in clusters on the ends of branches. Many of these flower bearing spikes are thrown out from one central spike, and are all strung with white, bell shaped flowers, rich in honey. The flower is midway in size and appearance between the whortleberry blossom and the lily of the valley. Unless there is a failure of the blossom, the honey yield is sure to be abundant; for, being in the woods with good roots, the flow is not checked by ordinary droughts, nor do the rains wash out the honey from the pendant, cup-shaped flowers. Often have we regaled ourselves, while riding along the road, by breaking a bunch of the blossoms, shaking out the honey in the hand, and licking up the delicious nectar. It bears no fruit, but each flower, as it dries up, produces a

brown seed pod about the size of a large grain of wheat, which separates when ripe into five parts, and permits the very fine seed to fall to the earth.

With improved methods of securing honey and sending it to market, we believe that, in suitable localities in Virginia, North Carolina, South Carolina, Tennessee, and Georgia, immense quantities of the most attractive honey can be secured from this source. The extent of its growth may be wider, but not to our knowledge. Let those speak for themselves where it abounds, that the extent of this source of development of the honey industry may be better known.

We omitted to state that the tree commences to bloom the latter part of June, and the harvest from this source lasts until the middle of July.

We are inclined to think that the tree would thrive in more northern latitudes; perhaps, anywhere in our land. It is found abundantly, in many parts of the Alleghany mountains, where it is very cold, the thermometer often indicating several degrees below zero.

JAMES W. SHEARER.

Liberty Corner, N. J., July 4th, 1878.

The following is from Feb. No. of GLEANINGS, for 1880.

SOURWOOD HONEY, ETC.

I send you to-day a sample of sourwood honey. Examine it and let us know what you think of its quality. I get more of it than of any other kind. I took about 800lb. last year from the poplar, and something more than 1,200 from the sourwood, all extracted.

Now, Mr. Novice, nearly all of you bee men up North say that all pure honey will candy in cold weather; and I want you to keep the sample I send you through the winter, and report if cold weather candies it. I know you have colder weather than we have down here, but I don't believe it will get cold enough to candy sourwood honey.

J. F. MONTGOMERY.

Lincoln, Tenn., Jan. 5, 1880.

Thanks, friend M. You will see on page 77 that I do not claim that *all* pure honey will candy. If sourwood honey never candies, it will be a great point in its favor, and I would pay a good price for a barrel of it now, just on account of this one peculiarity. The sample is at hand, and, although it is not as light as our clover and basswood, the color is fair, and the flavor is beautiful. Its aroma is delightful, and has a suggestion of timber and forest trees.

SPIDER FLOWER (*Cleome Pun-gens*). This has but recently been brought into notice as a honey plant. It belongs to the same family as the ROCKY MOUNTAIN BEE PLANT, which it much resembles.

Early in 1878, Mollie O. Large, of Pine Hill Apiary, Millersville, Ill., sent me some seeds, which I had started in a flower pot, in the house, but transplanted them to the garden sometime in May. Aug. 16th, they were in full bloom, and the bees were at work upon them, but, strange to say, the blossoms opened only at about sunset; ac-

cordingly, after the time when the bees have usually stopped flying, they were seen eagerly hovering over this strange but beautiful plant.

The petals, which are of a lovely, deep pink, are all on one side of the blossom, and on the other side, we see what resembles the long, sprawling legs of the spider. The foliage is also quite ornamental, and we have decided to have a bed of it on our honey farm.

In Sept. of the same year, Mrs. Large wrote as follows:

Our experience with the spider plant, this season, is this: It commenced to bloom about the 25th of June, and the bees have worked on it every fit day since. They commence about 5 o'clock P. M., and work until dark. I used to think bees went home with the sun, but I have heard them on this plant when too dark to see them at any distance, and found them again in the morning as soon as it was light, and for a while after sunrise. If you tie a piece of mosquito bar over a bunch of the flowers, in the afternoon, and examine it about sun-down, you can see the honey for yourself. We have about 1-10 of an acre this year, but expect, next season, to plant several acres, as we consider it ahead of anything that we have tried for honey.

MOLLIE O. LARGE.

Pine Hill Apiary, Millersville, Pa., Sept 11th, 1878.

Acting upon her suggestion, we tied a piece of lace over one of the blossoms on our plants, to keep the bees from it, and the drop of honey that collected was so large that I had a fair taste of it. It was very white and limpid, but had a slightly raw, unripened taste, which I presume the bees would know how to remedy.

LATER.

To-day is the 11th of October, 1879. This morning I got up before 6 o'clock. I had been reading, the night before, in Muller's book, "The Life of Trust," and I was particularly impressed with what he says about early rising, and the blessings God sends to those who make it a point to rise early and give their best and freshest thoughts to him. I put the book away, and went right to bed, that I might get up early. The gray of approaching daylight heralding in this warm autumn day met my gaze as I sallied forth toward the factory. I opened my mouth and took in the fresh pure air, and, as I opened my eyes to the beauty of the world we dwell in, I opened my heart in thankfulness to Him who gave it all. As I came near the garden, I was surprised to hear a loud humming so early. It was not robbing, but it was a hum of rejoicing. How strange it is, that bees will make this happy hum over the honey from the flowers, but never over syrup

from any kind of a feeder. The sound led me to the spider plant. It had been bearing honey a couple of months, at night, and early in the morning, but I had no idea that they ever made so much noise over it as now. I approached leisurely, but was startled to find that each floweret contained a large drop of some liquid, so large, in fact, I thought it must be dew, and not honey. I touched my tongue, and behold it was fair honey, of a beautiful limpidity and taste, and then I understood the humming. As a bee alighted, and made his way down between the stamens, I watched until he spread out that delicate, pencil-like tongue, and began to draw in the nectar. Surely no bee can take in so large a drop; and so it proved. He lapped as long as he could and then rested awhile; again he sipped the "sparkling ambrosia," and again he stopped. I could imagine him soliloquizing as he dipped into it a third time.

plant; if the name were not so long, we would call it so, for the credit she deserves for calling attention to it. Dear me! the honey farm will not be large enough. I have set the hands, to-day, to doing more under-draining, and I am going to plow up all corners, and work up close to the fences, for we cannot afford to have a weed grow on the premises, so long as there are plants that bear honey like this. These plants are in our flower garden, close by the building, and have had a very rich, deep soil. This, perhaps, may account for such large amounts of honey. This plant is strikingly like the Rocky Mountain bee plant of which I have given you a picture already, but it is so much larger, and bears so much more honey, that I can hardly think it worth while to offer the seed of the latter for sale any more. Our engraver has given you a picture of the plant, as it appears in our garden.

The picture scarcely needs explanation.



MRS. MOLLIE O. LARGE'S SPIDER PLANT, THE GREAT HONEY PLANT OF THE AGE.

"Did anybody ever before hear of a single floweret containing more than a bee could carry?"

He finally spread his wings, and essayed to fly, but his greed had been too great, and when he bumped against a Simpson plant, which is now out of bloom, down he went on his back in the dirt. Others did the same way, but soon they tried again, and I presume created a commotion in the hive, by coming in, poded out with such a load. Now will our friend, Mollie O. Large, tell us if she has ever seen the like among her plants? An acre would furnish—whew! I should not be surprised if it made a barrel of—sweetened water, any way, every morning. Now I want four acres of the Simpson honey plant, and four more of the Mollie O. Large honey

On one side is the beautiful leaf of the plant; on the other, one of the flower stalks, of which there are from 12 to 20 to each plant. As the flowerets, shown in the centre, keep blossoming each evening, the stem grows out in the centre, until it becomes, finally, two feet long or more, and lined with seed pods its whole length. These seed pods, when ripe, break open, and the seed must be gathered daily, or it is lost. Each floweret opens twice, but the honey is yielded only from the first blooming. In the center of the picture, a single floweret is shown, with its load of honey sparkling in the rays of the rising sun. The sight of a whole plant bending beneath a sparkling load of nectar like this is enough to set any bee keeper crazy, let alone your enthusiastic old friend

Novice. Our plants are on ground made by piling up the sods taken from where the factory stands; this may, in part, account for the great yield of honey.

MORE ABOUT THAT WONDERFUL SPIDER PLANT.

Oct. 14th. — Yesterday morning, Mr. Gray came down before sunrise, to verify my observation and see that there was no mistake about that large drop of honey, the product of a single night. There is no mistake. Not only does a single floweret produce a large drop, but some of them produce a great many drops. Last evening, we made observations by lamp light; and, before nine o'clock, the globules of honey were of the size of large shot. The crowning experiment of all took place this morning. I was up a little after 5 o'clock, and, with the aid of a tea spoon, I dipped honey enough from 3 or 4 plants to fill a 2 dram vial, such as we use in the queen cages, a little more than half full. The honey in some of the flowerets had collected in a quantity so large that it spilled out and actually streamed on the ground. I have called this honey, but it is, in reality, the raw nectar, such as is found in clover and other flowers. The taste is a pure sweet, slightly dashed with a most beautiful, delicate flavor, resembling somewhat that of the best, new, maple molasses. The

honey will be as white as the whitest linden, so far as I can judge. With the aid of a lamp, I evaporated the nectar down to thick honey. You can see something of what the bees have to do, when I tell you that I had in bulk, only about 1-5 part as much, as when I commenced. You can also see that we now have some accurate figures with which to estimate the amount of honey which may be obtained from an acre of honey-plants.

HOW MUCH HONEY WILL AN ACRE OF PLANTS YIELD?

I think I visited with my spoon, four plants. Perhaps half of the nectar was wasted, either by overflowing before I got there, or in my attempts to spoon it out. This will give a half dram of nectar to each plant, each morning. We shall set the plants 3 feet apart each way. At this rate, we have nearly 5,000 plants to the acre, and they would yield every morning, perhaps 5 gallons of nectar or one gallon of ripe honey. The plant has been in bloom in our garden, for the astonishing length of time, of about 3 months; this would give, counting out bad weather, perhaps, 60 gallons of honey, worth—say \$60.00. I have known a single colony of bees to gather a gallon of raw honey in a day, from the clover, but as the bees seldom work on the spider plant after 9 or 10 o'clock in the morning, an acre might require 5 or 10 colonies, to go all



THE BEES AND THE SPIDER PLANT.

TIME AND PLACE.

SCENE,—The flower garden adjoining the Factory.

TIME,—Half past five o'clock, in the morning, Oct. 11th.

For particulars of the "play," see page 220.

DRAMATIS PERSONÆ.

NOVICE, who has just got up.

THE BEES, who have just "got up."

"OLD SOL," who has just "got up" too, and who seems to have a lively interest in the proceedings, as he shows his "shining face" just over the top of the wire fence.

over it every morning. How many acres of our best honey plants will be required, to keep 100 colonies out of mischief? As the Simpson honey plant yields honey all day long, the two would go very well together; and I am inclined to think 5 acres of each (*good* soil, *well* cultivated) would keep 100 colonies of bees busy and out of mischief at least, during the whole of the fall months when bees have nothing to do.

Bear in mind, my friends, that this plant yields by far the largest amount of honey of anything that we have ever come across, and that its time of blossoming extends to an unusual length. It may be also, that this amount of nectar is only caused by the unusually fine, warm, October weather we are now having.

Our boys are, to-day, planting out 1,000 Simpson honey plant roots. I would advise no one to undertake such experiments, unless they can stand a failure, if it should prove such.

Shortly after the above was written our artist, as a piece of pleasantry, made the *rude* sketch, found on the previous page. See INTRODUCTION, concluding remarks.

STINGS. It is true that bees cannot bite and kick like horses, nor can they hook like cattle, but most people, after having had an experience with bee stings for the first time, are inclined to think they would rather be bitten, kicked, and hooked, all together, than risk a repetition of that keen and exquisite anguish which one feels as he receives the full contents of the poison bag, from a vigorous hybrid, during the height of the honey season. Stings are not all alike, by any means, and while I can stand the greater part of them without even wincing, or stopping my work, I *occasionally* get one that seems as if it could not possibly be borne. As I always find myself obliged to bear it, however, I try to do so as best I can.

I have often noticed that the pain is much harder to bear, if I stop and allow my mind to dwell on it; or after being stung, if I just think of former times when I have received painful stings, at the mere thought, a sudden pang darts along the wounded part. I do not know why this is, unless it is the effect of the imagination; if so, then it is clear to my mind that even imaginary pains are very hard to bear. I have sometimes purposely, by way of experiment, allowed my mind to dwell on the pain of the sting the moment it was inflicted, and the increase would be such, that it would almost make me scream with pain. If you doubt this, the

next time your feet get very cold, just think of wading barefooted in the frozen snow, at a zero temperature. Perhaps my imagination is unusually active, for it sometimes makes the pain, when riding in the cold, almost unbearable, while I get along very well if thinking of something else. Well, if others have had a similar experience, and I presume you all have, you can see why I have so often given as a remedy for stings, simply to keep on with your work, and pay no attention to the stings whatever.

Of course, where stings swell on one so badly, as to shut an eye, or the like of that, I presume you might be obliged to stop work awhile, but even then, I would advise paying as little attention to the matter as it is possible to do, and by all means to avoid rubbing or irritating the affected part. I have known stings to be made very painful, by rubbing and fussing with them, that I have good reason to think would have given little, if any, trouble otherwise. You all know that when you get warmed up with hard work, a bruise, a bump, or a slight flesh wound gives little if any pain; but to sit down calmly and cut into one's flesh gives the most excruciating pain. When a lad, I have repeatedly cut great gashes in my fingers with my jack knife, and felt but little pain at the time, but when it became necessary to lance the flesh to get a sliver out of the foot, or to cut open a stone bruise, the pain was the most intense I can imagine. To pare away with the razor until you get through the skin, and see the blood start—why, it makes my flesh creep to think of it now; but the clips that came unawares with the dull jack knife were scarcely heeded at all, more than to tie up the wound to keep the blood from soiling my work.

Well, the point is, we are to take stings just as we used to take the cuts with those jack knives, in our boyhood days. Of course, we are not to rush needlessly into danger, but when it comes, take it philosophically. I would pull the sting out as quickly as possible, and I would take it out in such a way as to avoid, as much as possible, squeezing the contents of the poison bag into the wound. If you pick the sting out with the thumb and finger in the way that comes natural, you will probably get a fresh dose of poison in the act, and this will sometimes prove the most painful of the whole operation, and cause the sting to swell when it otherwise would not have done so.

I have sometimes thought it might be nearly as well to leave the sting in the wound. I

have frequently found them when washing, and the presence of the sting was the first indication I had that I had been stung; but I presume I knew at the time that a sting had been inflicted.

THE PROPER WAY TO REMOVE A BEE STING.

The blade of a knife, if one is handy, may be slid under the poison bag, and the sting lifted out, without pressing a particle more of the poison into the wound. When a knife blade is not handy, I would push the sting out with the thumb or finger nail in much the same way. It is quite desirable that the sting should be taken out as quickly as possible, for if the barbs (to be described further along) once get a hold in the flesh, the muscular contractions will rapidly work the sting deeper and deeper. Sometimes, the sting separates, and a part of it, one of the splinters, so to speak, is left in the wound; it has been suggested that we should be very careful to remove every one of these tiny points, but after trying many times to see what the effect would be, I have concluded that they do but little harm, and that the main thing is, to remove the part containing the poison bag, before it has emptied itself completely into the wound. When I am very busy, or have something in my other hand making it inconvenient to remove the sting with my knife or finger nail, I have been in the habit of rubbing the sting out, against my clothing, in such a way as to push the poison bag off sideways, and although this plan often breaks off the sting so as to leave splinters in the wound, I have found little, if any, more trouble from them than usual.⁷²

REMEDIES FOR BEE STINGS.

For years past, I have taken the ground that remedies of all kinds are of so little avail, if of any avail at all, that the best way is to pay no attention to any of them. This has awakened a great deal of arguing, I know, and the remedies that have been sent me, which the writers knew were good, because they had tried them, have been enough to fill pages of this book. I have tried a great many of them, and for a time, have imagined they "did good," but after giving them a more extended trial, I have been forced to conclude that they were of no avail. Nay, farther, they not only did no good, but if the directions with the remedy were to rub it in the wound, they did a positive harm; for the friction diffused the poison more rapidly into circulation, and made a painful swelling of what would have been very tri-

pling, if let alone. Please bear in mind that the poison is introduced into the flesh through a puncture so minute, that the finest cambric needle, could, by no manner of means, enter where the sting did, and that the flesh closes over so completely after it, that it is practically impossible for the remedy to penetrate this opening; now, even if you have a remedy that will neutralize the bee poison, in something the same way that an acid neutralizes an alkali, how are you to get the remedy in contact with the poison? I know of no way of doing it, except we resort to a surgical operation, and if you will try that kind of "tinkering" with one bee sting, you will probably never want to try another. I tell you, there is no remedy in the world like letting it alone, and going on with your work without even thinking about it. But suppose we get a sting under the eye, that closes up that very important organ; shall we go on with our work still? Well, I believe I would go on with my work still, and do the best I could do with one eye. If both were closed at once, I do not know but I would wait awhile until they should get open again. I would not resort to medicine and "tinkering," even then, but would let the eyes alone, until they came open of themselves.

If the wound is feverish, or if a person has received a great number of stings at one time, an application of cold water or cloths wet in cold water may prove a relief, but even in using this simple means, I would lay the cloth on very quietly, and carefully avoid rubbing or irritation. I have often dipped my hand in cold water after having a painful sting, but as my hand ached just as bad under the water (it really ached worse, because I had nothing else to do but to stand there and think about it), I soon dropped that remedy also. A year or two ago, kerosene oil was suggested as a remedy, and two of our friends regarded it of such importance, that they almost got into a controversy about which was entitled to the honor of the discovery. Well, I had a very bad sting on my hand, and I went for the oil can, and dropped oil on the spot for some time; as kerosene will remove a rusty bolt or screw when nothing else will avail, and as it seems to have a wonderful power of penetrating all cracks and crevices, I began to have faith that it might follow the sting of the bee, and in some way neutralize the poison. I had the satisfaction of having one of the most painful and lasting stings I ever got, and together with the offensive smell of the oil, it quite

sickened me of that, as a remedy. I presume the oil made it no worse, but it really seemed to me that it must have done so.

In discussing this matter of bee sting remedies, we should remember that the pain of a sting very often ceases suddenly, with no application whatever; those who have been stung a great deal will all tell you that this is the case. Well, the beginner who carries his saleratus water or hartshorn, and always makes an application of some kind, will tell you, and truthfully too, that the pain stopped the very moment the remedy was applied. Again; some stings swell very badly, while others do not swell at all. Well, if an application is made, and no swelling results, he will remember how former stings had swelled, and at once ascribe the difference to the remedy applied. You will see from this, that it is only by repeated trials, extending through a considerable period of time, that we can arrive at the truth. There is one rule that will apply to this, and to a great many other similar matters. If a thing is really good, it will come into general use, and stay there, not only for a few weeks and months, or for a single season, but will be in demand year after year. If I am correct, not one of the bee sting remedies have stood this test. Sooner or later, they have all been dropped, and old bee-keepers get along in the way I have advised—picking the sting out, if they are not in too much of a hurry, and thinking no more about it.

WHAT TO DO WHEN STUNG A GREAT NUMBER OF TIMES, ALL AT ONCE.

There is very seldom any need of such a catastrophe, but as such an event may come about, it may be well to consider the matter. In hiving hybrids, under certain conditions, I have known them to attack the operator in a mass, and sting him most unmercifully. A neighbor of ours was stung in this way until he fainted, and had to be carried into the house. In such cases, I would resort to the usual means to restore the person from the fainting fit, and then extract the stings as speedily as possible, and treat with wet cloths. It is true that death may result from the stings of bees, and if report is correct, a single sting has been known to result in death, in very rare instances. Shall we stop keeping bees on this account? People are killed by horses almost every day, and such cases are comparatively frequent, but did anyone ever advocate giving up the use of horses on that account? Cases that have resulted fatally, or in laying a person up for a time, or have produced fainting, are usually

where the person is stung for the first time; after the system gets inured to the poison, its effects are comparatively harmless.

GETTING HARDENED TO THE EFFECTS OF STINGS.

When I first commenced bee keeping, stings swelled so badly and were so painful, that I had either my hands or eyes swelled up most of the time, and I seriously contemplated giving up the business, just on this account alone. After I had had a little more practice, I discovered that there was very little need of being stung at all, if one was careful not to provoke the ire of the little insects. Still further, I found the swelling to be gradually less and less, and before my first summer was over, I very seldom felt the effects of any sting, the day afterward. When first commencing, if my eye was swelled so as to be closed by a sting, it often took until the third day, to have it go down entirely. The A B C class, almost without exception, corroborate this experience.

HOW TO AVOID BEING STUNG.

Some may imagine, from the foregoing, that it is necessary for one who keeps bees to submit to the pain of being stung several times, every day. A short time ago, a lady said that she could never stand it to have her husband keep 100 swarms, for she got stung four or five times a day with only a dozen, and 30 or 40 stings a day would be more than she could possibly bear. Now, my friends, I think I can take any one of you into an apiary of 100 colonies, and have you assist me all day long, without your getting a single sting. Nay, farther; if you are very timid, and cannot bear a single sting, by taking some pains, you may be able to work day after day, without being stung. The apiary must be properly cared for, and no robbing allowed, and you must do exactly as I tell you. See ANGER OF BEES. It may be a hard matter to tell you in a book how to behave without being stung, but I will try. In the first place, avoid standing right in front of any hive; I am often very much tried with visitors (some of them bee-keepers, too, who ought to know better), because they will stand right before the entrance until they have a small swarm scolding around them because they cannot get out and in, and then wonder why so many bees are buzzing about in that particular spot.⁷³ If you should go into a factory, and stand in the way of the workmen until a dozen of them were blocked up with their arms full of boards and finished work, you would be pretty apt to be told to get out of the way. Now you are to exer-

cise the same common sense in an apiary. By watching them, you can tell, at once, their path through the air, and you are to keep out of their way. Right back of any hive is a pretty safe place to stand.

One of the first things to learn is to know whether a bee is angry or not, by the noise he makes. It seems to me you should all know by the hum of a bee, when it is gathering honey from the heads of clover in the fields, that it has no malice toward any living thing; it is the happy hum of honest industry and contentment. People sometimes jump, when a bee hums thus harmlessly along, and it seems to me they should know better, but I presume it is because bees are not in their line of business, and they don't know "bee talk."

Well, when you go in front of a hive, or even approach hives that are not accustomed to being worked with, one of the sentinels will frequently take wing, and by an angry and loud buzz, bid you begone. This note is quite unlike that of a bee upon the flowers, or of the ordinary laborer upon the wing; it is in a high key, and the tone, to me, sounds much like that of a scolding woman, and one who will be pretty sure to make her threats good, if you do not heed the warning. When one of these bees approaches, you are first to lower your head, or better still, tip down your hat brim; for these fellows almost always instinctively aim for the eyes. He will often be satisfied and go back into his hive if you move away a little, but you do not want to give him to understand that you admit yourself a thief, and that he has frightened you. If he gets very threatening, and you are timid, you would better go into some building. I am in the habit of opening the door of the honey house, and asking visitors to go in there, when an angry bee persists in following them. Very many times I can hardly get them to go in as I direct, because they cannot see why the bee will not follow them, and thus have them cornered up and a sure prey.

I do not know why it is, but a bee very seldom ventures to follow one in doors. A single bee never does, if I am correct, but a very vicious colony of hybrids, when fully aroused, may do so. I have learned by habit, to know just about when one of these cross bees is ready to sting, and the greater part of the time, I can catch them in the act of inserting their stinger, before I am stung. Sometimes I get a slight prick, but not often. Where there has been no robbing going on,

one has usually warning enough, and in ample time, to take precautions. Where the bees are quietly at work, that is, during the working season, there is but little danger from bees in the air. When you are working with a hive, bending right over the uncovered frames, you are comparatively secure from the bees of other hives, for when there is no robbing, bees seem to have no disposition to meddle or hang around their neighbors' homes. This is one reason why bystanders, or those who are off at a little distance, are so much more apt to be stung than the apiarist who is right among them.

HOW TO OPEN A HIVE, WITHOUT BEING STUNG.

Have your smoker lighted, and in good trim, and then set it down near the hive you are going to work with. Now, I would never use smoke with any hive of bees, unless they need it to subdue them. for why should we disturb and annoy the little fellows while quietly going about their household duties, unless we are obliged to? I frequently open hive after hive, with no kind of use for smoke at all, and yet I often see bee-keepers drive the poor little chaps down to the bottoms of their hives with great volumes of smoke, when they had not shown the least symptom of any disposition but the most friendly one. It is true, where the colony is very large, the bees sometimes pile up in the way, on the rabbets and ends of the frames, so that it becomes desirable to drive them away for their own safety. For this purpose, very little smoke is needed, and if you are in no great hurry, they will clear out of the way, if you just pat them on the backs gently with a weed or bit of grass. If the bees are disposed to be cross, and to show fight, you will readily discover it, the minute you turn up the first corner of the cloth covering, and if it takes smoke to make them beg pardon, give them smoke, but only in small quantities until you are sure more is needed. The top of the hive is supposed to be off, the sheet removed, and yourself down on your knees on the sawdust beside the hive. If it is a chaff hive, you work standing, but lean your body against the hive. With your eye, decide which one of the 10 frames will come out easiest, and slide the rest on the rabbets a little away from it. By sliding two or three on each side, you can have all the room you need to lift out the frame without pinching a single bee. Now this taking out not only the first frame, but any or all the frames, is a very important matter, if you wish to do it without getting

stung. Suppose you are obliged to pass through a room, with the floor all covered with babies, creeping about. As you lift your feet and set them down, you will probably exercise some care, for it would be quite a serious piece of business to hit one of the soft little things a blow with the heel of your great, awkward boot. Now I wish you to think it just as serious a matter to mash one of these little innocents while faithfully doing their work in their own home. I know you will say, some of you, that you haven't the time to be so careful, but I tell you God holds you responsible for any needless cruelty you may inflict on these dumb friends. Besides that, you will make more money, to be humane and gentle, than if you smash ahead, regardless of everything except the money you can squeeze out of these little creatures. If you can lift out the frames and put them back without harming a bee, you can get along, usually, without any smoke, if you choose. It is much easier to handle a shallow frame, without killing bees, than it is a tall one.

We should try to bear in mind that a single bee bears much the same relation to the colony, as does one of our fingers or toes to us. If somebody carelessly or purposely pinches a toe or finger, self preservation demands that we make him stop, and if you crush a bee, the whole hive remonstrates and threatens; in fact, they do this if you only give them reason to think they may be in *danger* of injury. Your business is to assure them by your careful and gentle movements that they need fear no injury from you, and then you will find them very patient, and as tractable as any of our domestic animals.

When I see a person opening a hive, I usually watch him carefully, to see if he takes care to kill no bees. After the first frame is taken out, it must be placed somewhere. I believe the usual way is to stand it on end, leaning against the side of the hive. Now the corner of the frame that rests on the ground is very apt to be covered with bees, and many, many times, after it has been put ack in the hive, have I seen the maimed and mashed bodies of the little fellows, writhing in their death agonies. Do you blame bees for stinging when they are treated thus? Why will people be so careless and heedless of the comfort and life of the rest of the animated creation?⁷⁴

Within the last year, several devices, engravings of which we give below, have been suggested for the purpose of holding the

first frame or frames, that the rest may be manipulated with greater ease.

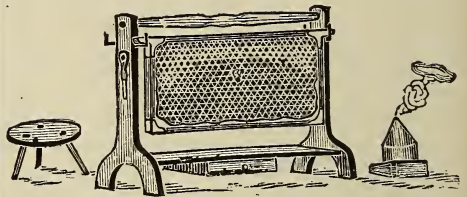
One of the simplest of these, made of folded tin, and originated by myself, I have christened



THE SIMPLICITY COMB HOLDER.

This is to be hooked over the edge of a Simplicity hive, and when the first frame is lifted out, you are to hang it on the two projecting arms. These are slightly turned up, as you will notice, that the frame may not easily be pulled or slipped off. If you are disposed, you can then slide the remaining frames along, so as to get at any particular one, with ease.

To J. M. Valentine's comb holder, which he has called a queen stand, because used by him principally in queen rearing, our engraver has taken the liberty of adding a smoker, and a stool whereon the tired apiarist may repose (?), while inserting queen cells, etc. He has also hung an all metal screw driver on one of the posts, as you see, and a stout screw driver is a very handy tool in an apiary, as most of you have probably experienced.



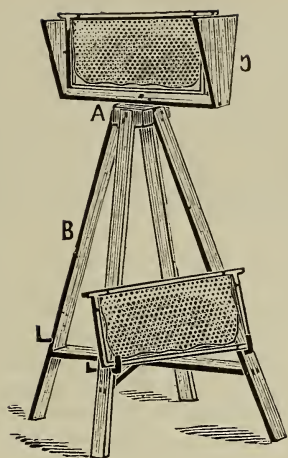
VALENTINE'S QUEEN STAND.

This is 24 inches high; the standards are $1\frac{1}{2} \times \frac{1}{2}$ in.; a piece $1\frac{1}{4}$ in. square runs across the top to hold it together, and for a handle to lift it by; the shelf is 12 inches wide, and is placed 4 inches below the bottom of the frame when hanging on the arms of the stand. This shelf is handy to lay cages &c. on. There is a drawer $6 \times 8 \times 2$ in. under the shelf, in which we keep a dozen, more or less, of queen cages, a pair of small curved pointed scissors, a slim sharp knife, etc. Our queen stand (as we call it) weighs just 4 lbs. We leave it out in the bee-yard, as it is well painted and a groove is cut around on the under side of the shelf so that no water can get into the drawer. When we are in the yard, and happen to want to look into a hive, the stand and its contents are ready near by.

J. M. VALENTINE.

Carlinville, Ill.

Another very convenient device is the following with a description by the originator.



AN EASEL TO HOLD COMBS.

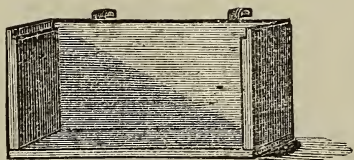
The stand is made as follows: take a cubic block, A, measuring four inches each way, and four strips of wood, B, $1\frac{1}{4}$ inches square by 3 or 4 feet long; nail these strips one at each corner of the block for legs; spread the lower ends about 18 inches apart, and secure them by nailing cross pieces about half way down. In the middle of the top, or block, put a round nail letting it project upward about $1\frac{1}{2}$ inches. This is for a pivot. Take three pieces of board, C, 4 inches wide; let the one for the bottom have the same length as the inside of your hive, and the other two for the sides have the same length as the height of the hive; nail the two side pieces on the ends of the bottom piece, and bore a hole in the centre of the bottom piece, large enough to fit the pivot in A; place this, C, on the stand, A, and you have a swivel; hang your frame in it, and you can hunt for your queen at leisure, turning C as you choose, without disturbing the bees in the least. If the bees cluster on C, it can be removed, and the cluster brushed into the hive.

On the legs, little cleats may be nailed, on which to place additional frames if desired. We find our bee easel a handy institution, and would not be without one.

MOSES G. YOUNG.

Brooklyn, N. Y., Aug. 29, 1878.

Perhaps the simplest and cheapest of all these devices is the one sent us by Mr. L. S. Jones, of New Philadelphia, O., which he has called the Simplicity comb holder, and describes as below:



JONES' SIMPLICITY COMB HOLDER.

It answers the purpose nicely, is very easy to make, and costs almost nothing. When I finished the invention, I imagined friend Root saying, "Well now, that holder can be made and finished for about 10 cents, perhaps $9\frac{1}{2}$, and the work ought to be well done at that price."

HOW TO MAKE IT.

Take a piece of $\frac{3}{4}$ lumber, size $20 \times 9\frac{1}{2}$ inches; also cut two pieces, $9\frac{1}{4} \times 2\frac{1}{4}$, and $\frac{3}{4}$ inches thick; saw a rabbet $\frac{1}{2} \times \frac{3}{4}$ inches, in one end of each, in which tack a tin rabbet $\frac{1}{4}$ in. high; nail these ends to the side board; also nail on a thin bottom board $20 \times 2\frac{1}{2}$ inches; then fasten on two pieces of hoop iron and bend to hang on the Simplicity hive; finish by giving it a good coat of paint, and you have one of the cheapest and handiest things about the apiary.

While these implements are very handy, without question, they are [more machinery to have around in the way, and it takes time to run after them and carry them about. I do not know but that I should prefer doing without them, but you will probably have different tastes and views in the matter. I have illustrated them, that you may be able to act according to your own judgment. If you decide to stand the first frame on the ground, be sure that you brush or drive all the bees off the corner that is to touch the ground. Be sure, also, that you set the frame at such an angle that it cannot possibly fall over, or be blown down by the wind. On this account alone, I would want wind breaks of some kind, to keep off the prevailing winds. See COMB BUCKET.

If your colony is a small one, and the hive not full, the frames are very easily handled without killing bees; if there is a division board, it can be moved back a little, and the first frame set on the other side of it. All these things can be done very quickly, when you get used to it; much quicker than you could take out a movable side to a hive. I believe experience has taught this with almost everyone that has used hives with movable sides. No matter how sanguine the inventor may be, at first, that his hive is the one to prevent danger from stings, in a few years, we find all such hives dropped, and laid aside.

WHAT KIND OF BEES STING WORST.

The general decision is that the pure Italians are, as a rule, the most easily handled. Not only do they sting less, but as they keep their places on the combs without getting excited, when hives are properly opened, they are far less liable to get under one's clothing, than the common bees. A great many stings are received from bees that are in no way badly disposed at all, simply by their getting pinched accidentally, while on the person of the bee-keeper. Pure Italians may be handled all day, with no such mishap; but after working among blacks or hybrids, I often find a dozen or more under my coat, up my sleeves, if they can get up, and worst of all, up my trousers, if I have not

taken the precaution to tuck them into my boots, or stockings when I wear low shoes. See BEE DRESS. Well, I believe this one thing alone would decide me in favor of the Italians, if they were simply equal to the blacks in other respects. The hybrids, as I have before stated, are much worse to sting than either of the races when pure.

It may be well to add, that we find many exceptions to these rules; a hive of blacks will sometimes be much easier to handle than a hive of Italians in the same yard, and the progeny of a queen that we may have every other reason to call pure, may be as cross as the worst hybrids. Still farther; a very cross swarm of bees may be so educated, by careful treatment, as to become very gentle, and *vice versa*. The colony in front of the door of the honey house is always a gentle one, season after season; the explanation of it is that they become accustomed to the continual passing and repassing of the bee-keeper in front of their hive, and learn to be dodging past some one almost all the time. On the contrary, those bees that are in the remote corners of the apiary are very apt to sting you, if you just come round to take a view of their entrance. The Egyptian bees are said to be very much worse than any of the other races, and as they do not yield to smoke, as do others, they have been discarded, principally on account of this unpleasant feature.*

THE BEE STING POISON.

When bees are very angry, and elevate that portion of their bodies containing the sting, you will often see a tiny drop of some transparent liquid on the point of the sting. This liquid is the poison of the bee sting. It has a sharp, pungent taste, and when thrown in the eyes, as often happens, it has a stinging, acrid feeling, as if it might be a compound of cayenne pepper, onion juice, and horse-radish combined, and one who tastes it or gets it in his eyes concludes it is not so very strange that such a substance, introduced into the circulation, produces such exquisite pain. The poison of the bee sting has been shown to be similar in composition to that of the viper and scorpion; but at the present writing, I can not learn that any chemist has ever given us an analysis that would tell us just what the poison is. The acid obtained from ants is called formic acid, and I have wondered whether that from bee stings is not similar, if not the same. It is

probably a vegetable acid, secreted from the honey and pollen that constitutes their food, and it is well known that the poison is much more pungent, when the bees are working in the fields and accumulating stores largely, than it is when they are at rest in the winter months. It is generally during basswood bloom, that we get those severe stings which draw the blood and show a large white spot around the wound.

HOW IT IS DONE.

It is quite an interesting experiment to let a bee sting you on the hand, and then coolly observe the whole performance, without disturbing him. When a boy wishes to jump across a brook, he usually goes back a few feet, and takes a little run; well, a bee when he introduces the point of his sting, prefers to make a short run or dash, or he may fail in lodging the barbs of the sting securely in the flesh. I do not believe a bee can very well get up the necessary energy to sting, unless he is under the influence of some excitement. I have sometimes, in trying to see how far I could go with an angry colony of bees without the use of smoke, had a lot of them strike my face with a sudden dash, but as I kept perfectly still, they would alight without stinging. Now the slightest movement, even an incautious breath, would result in some pretty severe stinging; but if I kept cool and quiet, and carefully walked away, I might escape without any stings at all. Very often, a single bee will work himself up to a sufficient passion, to try to sting, but to commence while standing still, I have always found to be rather difficult work for them, and although they sometimes prick slightly and give one a touch of the poison, they seldom sting very severely, without taking wing again. To go back; after the bee has penetrated the flesh on your hand, and pumped the sting so deeply into the flesh as to be satisfied, he begins to find that he is a prisoner, and to consider means of escape. They usually get smashed at about this stage of proceedings, unless they succeed in tearing the sting—poison bag and all—from the body; however, if allowed to do the work quietly, they seldom do this, knowing that such a proceeding seriously maims them for life, if it does not kill them. After pulling at the sting to see that it will not come out, he seems to consider the matter a little, and then commences to walk around it, in a circle, just as if it were a screw he was going to turn out of a board. If you will be patient and let him alone, he will get it out by this very process, and fly off un-

*Queenless bees are almost always much worse; it may be because they seldom work with energy, and have therefore no fresh accumulation of stores, that tend so much to put bees on their good behavior.

harméd. I need not tell you that it takes some heroism, to submit patiently to all this manœuvring. The temptation is almost ungovernable, while experiencing the intense pain, to say, while you give him a clip, "There, you little beggar, take that and learn better manners, in future."

Well, how does every bee know that he can extricate his sting by walking around it? Some would say it is instinct. Well, I guess it is; but it seems to me, after all, that he "sort o' remembers" how his ancestors have behaved in similar predicaments for ages and ages past.

ODOR OF THE BEE-STING POISON.

After one bee has stung you, if you use the hand that has been stung among the bees in the hive, the smell of the poison, or something else, will be pretty sure to get more stings for you, unless you are very careful. Also after one sting has been inflicted, there seems a much greater chance, when about in the apiary, of getting more stings. Mr. Quinby has suggested that this is owing to the smell of the poison, and that the use of smoke will neutralize this scent. This may be so, but I am not fully satisfied of it.

DOES THE BEE DIE AFTER LOSING HIS STING?

It seems strange, after all that has been written about it, that nobody seems to know whether the bee dies or not. I know it does not die right away after losing its sting, for I have kept them some time in confinement, afterward, and could not see but they flew off just as well as bees that had not lost their sting. I am inclined to think they live and gather honey after the sting is gone, but they probably never do much more in the stinging line. The matter might be tested by painting the backs of a number of bees which have lost their stings, as we do in bee hunting. If you find them day after day in the hive, and see them with loads of pollen, we will then know that losing their stings does not spoil them for other duties. I have often identified certain bees, both in the hive, and on the alighting board as they came in from the fields.

SMOKE NOT ALWAYS A PREVENTIVE OF BEE STINGS.

Although smoke is our great reliance as a security against stings while working among bees, there are sometimes colonies, or seasons of the year, I scarcely know which, when one can get along better without it. I remember trying to open a colony of hybrids in the fall of the year, to show them to my wife. As a safeguard, I first gave them a good smoking; but, to my surprise, they got into a perfect panic, and poured out of the

hive and showed fight, in great numbers. It is true, I could drive them down, but the minute I ceased smoking them, to lift out a comb, they became perfectly infuriated, and although driven down to the bottom board repeatedly, they were up and ready for an attack, almost as soon as the smoker was turned away from the hive. I let them go, without half making the examination I wished. The next day, in passing the hive, I thought I would look in, and see if they were of the same opinion still. I had no smoker, and so raised the corner of the cloth over the frames cautiously. They kept on with their work, and seemed to care nothing about the intrusion. I took the cloth clear off, lifted frame after frame, but not a bee showed the least sign of hostility. In surprise, I carried a frame with the queen on it, into the house and showed it to my wife, and told her it was the same swarm that acted so wickedly, just the day before. The only trouble seemed to be that they very decidedly objected to having their hive deluged with the offensive smoke, and I am sure it must be very painful to them in its effects. I took the lesson, and have since often found that I could get along even better without smoke. Have your smoker in readiness, and if you are obliged to use smoke, use a very little, as circumstances seem to decide best. Sometimes, the only way seems to be to use it in considerable quantities, but I would never smoke the poor little fellows needlessly.⁷⁵

MECHANICAL CONSTRUCTION AND OPERATION OF THE STING.

After a bee has stung you, and torn himself away from the stinger, you will notice, if you look closely, a bundle of muscles, near by and partly enveloping the poison bag. Well, the curious part of it is, that for some considerable time after the sting has been detached from the body of the bee, these muscles will work with a kind of pump like motion, working the sting further into the wound, as if they had a conscious existence, and burned with a desire to wreak vengeance on the party attacked. Nay, farther, after the sting has been pulled from the flesh and thrown away, if it should stick to your clothing in such a way that your flesh will come in contact with it, it will commence working again, pulling itself into the flesh, and emptying the poison into the wound, precisely as if the living bee was himself working it. I have been stung a great many times, from a sting without any bee about it, at all. Without any precise figures, I should say a sting would hold life enough to give a very painful wound, as long

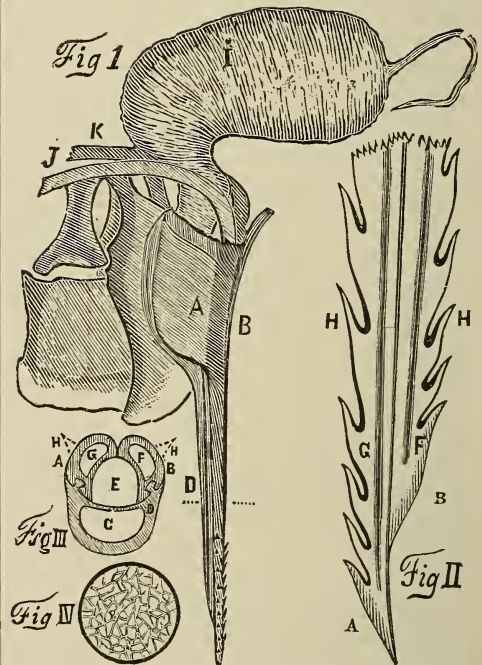
as full five minutes, and it may be, in some cases, even ten minutes. This phenomenon is most wonderful, and I have often, while watching the sting sink into the rim of my felt hat, pondered on that wonderful thing, animal life. Why should that isolated sting behave in this manner, when the bee to which it belonged was perhaps far away, buzzing through the air? Why should this bundle of fibers and muscles behave as if it had a life to throw away? I do not know. This, however, I do know; when you pull a sting from the wound, you should throw it far enough away so that it will not get back on your face or hands, or into your hair, to sting you again.

In giving the following description of a bee sting, I am much indebted to the drawings and description given by J. R. Bledsoe, of Natchez, Mississippi, in the *American Bee Journal* for August, 1870. I am also indebted to Prof. Cook's excellent Manual, for hints on this as well as on many other subjects. As friend Cook is an entomologist, he has been enabled to give us very material aid in that department. Friend Bledsoe has given us by far the most complete description and drawings, and I have just been trying, with a good microscope, to verify his work. Although I have not been able to verify all his work, probably because I lack the necessary skill in making dissections, I have found some items, which I think have not before been given, and I have made some changes, that I think brings the matter nearer the truth.

The sting under the microscope is found to be a beautifully fashioned and polished instrument, whose delicate taper and finish make a most surprising contrast with any instrument man has been able to produce. In shape, it appears to be round, but it is, in reality, more like a three-cornered file, with the corners nicely rounded off. It is of a dark red color, but transparent enough so that we may see the hollow that runs through the centre of each of its parts. These hollows are probably to secure lightness as well as strength.

I have given you three views of the different parts of the sting, like letters representing like parts in all. Bear in mind that the sting proper is composed of three parts, the outer shell or husk, D, and two barbed spears that slide partly inside of it. In Fig. 2, I have shown you the spears. The barbs are much like the barbs on a fish hook; and when the point of one spear, A, penetrates far enough to get one barb under the skin,

the bee has made a hold, and has no difficulty in sinking his sting its whole length into the wound; for the pumping motion at once commences, and the other spear, B, slides down a little beyond A, then B beyond that, and so on. The manner in which these spears are worked is, as near as I can make out, by a pair of something like pump handles, operated by small, but powerful, muscles. I have shown you the arrangement of these handles at J and K, Fig. 1st, as nearly as I could conjecture what it must be, from watching its workings under the microscope. These muscles will work, at intervals, for some time after the sting has been torn from the bee, as I have explained. They work with sufficient power to send the sting through a felt hat, or into a tough buckskin glove. I have often watched the bee while attempting to get his sting started into the hard cuticle on the inside of my hand. The spears will often run along the surface diagonally, so that you can see how it works down by successive pumps. The hollow in these spears is indicated at G and F, in Figs. 2 and 3.



BEE STING MAGNIFIED.

Fig. 3 is a transverse section, sliced across the three parts, at about the dotted line, D. A and B are the barbed spears; F and G, the hollows to give them lightness and strength; H H the barbs. It will be observed that the husk, D, encloses but little

more than $\frac{1}{2}$ of them. Now the purpose of this husk is to hold the barbs in place, and to allow them to slide easily up and down, also to direct them while doing this work. To hold all together, there is a groove in each of the spears, and a corresponding projection in the husk, which fit each other, as shown in the cut. This allows the barbs to project, to do their work, and yet holds all together tolerably firm. I say tolerably firm, for these spears are very easily torn out of the husk, and after a sting is extracted, they are often left in the wound, like the tiny splinters I have before spoken of. When torn out and laid on a slip of glass, they are scarcely visible to the naked eye, but under the microscope, they show as seen in Fig. 2.

Stings do not all have the same number of barbs. I have seen as few as 7 and as many as 9. The two spears fit nicely against each other, as shown in Fig. 3, and you will observe that the shape and the arrangement of the 3 parts leave the hollow, E, in their centre. This hollow is for a channel for this wonderful vegetable poison. The working of the spears also pumps down poison, and quite a good sized drop collected on the points of the spears while I saw them working under the microscope. Friend Bledsoe found a valve that let the poison out of the poison bag, into this wonderful little pump, but prevented it from returning. I have not been able to see this, but have no doubt that it is there. The drop of poison, after it has laid on the glass a few minutes, dries down, and seems to leave a gummy substance, that crystalizes, as it were, into strange and beautiful forms. I have tried to show it to you, in Fig. 4.

There are some things about the bee sting, I should much like to know. How do the muscles work those levers so as to make them pass and repass as they do? Is the bee sting acid, perhaps formic acid? If not, what is it?

I cannot close the subject of stings, without speaking of the wonderful similarity between the mechanism of the sting of the bee, and the apparatus furnished many insects for sawing and boring into wood and other substances, for the purpose of depositing their eggs. Almost precisely the same apparatus is used, but the barbs on the extremities are saws instead of the sharp hooks. If you will look at the cut, you will see that but very little change need be made in these barbs to convert them into saw teeth, and then we should have an engine for cutting and boring holes, that might eas-

ily be patented, if old dame Nature were so disposed. Now listen. If the insect had but one saw, even though he had strength to draw it back and forth, his light body would not give him purchase enough to do much execution with it. It is true he might "dig in his toe nails," and hold himself down so that he could work it to some extent, but then he could not change his position, according to his work, etc. When the saw was worked, instead of its cutting into the hard timber, his light body would be simply slid to and fro; but with two saws, like the barbed spears of the bee sting, working in a sheath to hold them together, he can stand his ground and use his enormous muscular strength to do rapid cutting, even if his body does not weigh only a half grain, or less. While one saw goes forward, the other goes backward, and the rapidity with which these insects work them enables them to make astonishing progress, even in substances so hard that one would not suppose they could make any impression at all. Now here comes in again the wonderful law I have spoken of so many times, on these pages. The insect that has the most effective and perfect set of tools will lay most eggs and have them most secure from the depredation of enemies, and his species will stand a better chance of survival than the individual or class with poorer tools. By giving a constant preference to the best workers, and taking into account how nature sports and varies, would it be strange, if, after the lapse of ages, the result should be the beautifully finished work we see through the microscope. I do not know that bee stings could develop into saws, or saws into bee stings, but if an insect should be found using its ovipositor as a weapon of defense, as well as for the purpose of egg laying, it might look as though the thing were possible. I am not an entomologist, and I do not know that any such insect has ever been discovered. Who will enlighten us?

SUMAC (*Rhus*). This is a sort of shrub, or small tree, readily known by its bunches of bright red fruit, having an intensely sour taste. The acid property, however, seems to be only on the surface of the fruit, in the red dust that may be brushed off. I have had no experience with the honey, which the bees sometimes get in large quantities from the small greenish flowers, but give the following from page 96, *GLEANNINGS* for 1874:

June 22d, 1874.—Contrary to expectations, we are now in the height of a wonderful flow of honey from

sumac, which of late years has not yielded much. Everything in the hives is filled full, and I am kept busy hiving swarms, as it has become too much of a job to keep them from swarming by removing frames of brood. G. F. MERRIAM, Topeka, Kan.

SUNFLOWER (*Helianthus*). This plant embraces a very large family, but the principal ones for honey, are the common sunflower, and the Jerusalem artichoke. During some seasons and in some localities, the bees seem to be very busy indeed on these plants, all the day long. The mammoth Russian sunflower bears flowers of enormous dimensions, and from the way the bees crowd each other about the nectaries, one would suppose they yielded much honey. The seed, which is yielded in large quantities, would seem almost to pay the expense of cultivation. The following is taken from page 36, Vol. III, of GLEANINGS.

My boy had a small box of sunflower seeds, which he kept as one of his playthings. Last spring he accidentally spilt them in the garden by the fence, and, old as they were, they came up profusely. They looked so thrifty, I took it into my head to transplant them. I set them all around in the fence, out of the way, where nothing else would grow to advantage, and, if you will believe me, I had an enormous crop. When they blossomed the bees went at them in earnest, and after the bees got through with them, there were several quarts of seed. I sold a dollar's worth to my druggist, and the balance I fed out to my hens, and as a writer of old has said, I found nothing so good and nourishing for laying hens as sunflower seeds. Then I cut off the empty heads, place them near the bee hives, fill them with sugar and water, and that suits the bees to a T. So you see I was at no expense, and they paid well. I write this that others may be benefited as well as myself.

DR. R. HITCHCOCK.

South Norwalk, Conn., Feb. 2, 1875.

SWARMING. All animated nature seems to have some means of reproducing its like, that the species may not become extinct, and, especially among the insect tribes, we find a great diversity of ways and means for accomplishing this object. In the microscopic world, we find simple forms of animal life contracting themselves in the middle until they break in two, and then each separate part, after a time, breaks in two, and so on. With bees, we have a somewhat similar phenomenon. When a colony gets excessively strong, the inmates of the hive, by a sort of preconcerted, mutual agreement, divide themselves off into two parties, one party remaining in the old hive, and the other starting out to seek their fortunes elsewhere.⁷⁶

I have carefully watched this proceeding, with a view of determining how the matter comes about, and whether it is because a

part of the bees become dissatisfied with their old home, and seek to better their condition, or because the queen leaves, for some reason of her own (because she has not room to lay her eggs, for instance), and the bees simply follow from a sort of natural instinct, because she is the mother of the colony, and an absolute necessity to their prosperity. After seeing a number of swarms issue, and finding that the queen was among the last to leave the hive, I concluded that the bees take the lead, and that the queen simply followed as a matter of course, in the general melee. Suppose, however, that the queen should not take a notion to join the new adventure; well, swarms do often start out, with no queen accompanying them, and they usually go back to the hive after a time, to try it again next day. If she does not go then, nor at the next attempt, they often wait until they can rear a new queen, and then go off with her. After I was pretty well satisfied that this is the correct idea of their plan, a little circumstance seemed to upset it all. A neighbor, wanting to make an observatory hive, drummed perhaps a quart of bees from one of his old hives. As he had no queen, I gave him a black queen taken from a hive purchased several miles away. I mention this to show that the queen had never been out of the hive, in the location which it then occupied. After a day or two, this neighbor informed me that I had played a fine trick on him, for my queen had gone home, and taken his quart of bees with her. I told him it was impossible, for she had never been out of the hive, only when I carried her over in the cage.

We went and looked in the hive she came from, and there she was, true enough, with the bees she had brought with her stung to death, in front and on the bottom board. It is possible that the bees swarmed out first, but even if they did, they certainly followed the queen in going back to her old home. We also know that bees sometimes follow a young queen, when she goes out to take her wedding flight.

It is my opinion that it is neither the queen nor the workers alone, that make the first start, but that all hands join together, and act in concert.

WHY BEES SWARM.

If you can contract the size of the hive, when honey is coming in bountifully, the bees will be very apt to take measures toward swarming, about as soon as the combs are full of brood, eggs, pollen, and honey. They will often wait several days

after the hive is seemingly full, and this course may not cause them to swarm at all, but it is very likely to. As soon as it has been decided that the hive is too small, and that there is no feasible place for storing an extra supply of honey where it can be procured in the winter, when needed, they generally commence queen cells. Before doing this, I have known them to go so far as to store their honey outside on the portico, or even underneath the hive, thus indicating most clearly, their wants in the shape of extra space for their stores, where they could protect them.

I believe want of room is the most general cause of swarming, although it is not the only cause; for bees often swarm incessantly, when they have a hive only partly filled with comb. First swarms usually come about from the cause I have mentioned, but AFTER SWARMING (which see) often gets to be a sort of mania with the bees, and they swarm, apparently, *without* a reason.

AT WHAT SEASON BEES USUALLY SWARM.

The old adage runs,—

"A swarm of bees in May
Is worth a load of hay;
A swarm of bees in June
Is worth a silver spoon;
A swarm of bees in July
Is not worth a fly."

There is much truth in this, especially if managed on the old plan; but with modern improvements, a swarm in July may be worth a silver spoon, or even a load of hay; possibly, both together. See AFTER SWARMING. A colony that was very populous in the fall, and has wintered finely, may cast the first swarm in May, in this latitude, but such events were very unusual before the advent of Italians. The latter often swarm during fruit bloom, and in some cases even earlier. In our locality, swarms do not usually issue until the middle or last of June. If the season is a little late, sometimes the greater part of them will come in July, and we almost always have more or less swarming going on during our national holiday. At this time, basswood is generally at its height, and we frequently have quite a yield from clover, after basswood is gone. On this account, swarms that come out during the first week in July, usually get enough to winter, and are therefore worth the price of a swarm of bees anyway. I presume the old adage referred, principally, to the amount of honey they would store; if the July swarms did not secure enough to winter over, and were allowed to starve, they would not be

worth the trouble of hiving them, and so they might be rated as of less value than a fly. Swarms that come out in June, would fill their hives, and perhaps make a surplus that, on an average, would bring at least a dollar, the old price of a silver spoon; while those that were so thrifty as to be able to start in May, would have the whole season before them, and if they did not get set back before white clover came out, would very likely make a surplus worth \$5.00, the market price of a load of hay. In some localities, bees seem to swarm in the latter part of July and Aug., and reports seem to indicate that they do it when little or no honey is to be had, and when the bees are disposed to rob; but such is certainly not the case here, for our bees give up all preparations for swarming, some little time before the honey crop has ceased. I do not remember ever to have seen a natural swarm issue here later than July, but in some localities, buckwheat swarms are a very common thing. Where the apiarist has plenty of extra combs filled with stores, it is an easy matter to care for and make valuable stocks of swarms that issue at any time.

SYMPTOMS OF SWARMING.

Although we can sometimes tell when bees are going to swarm, I do not think it will be safe, by any means, to assume that we can always do so. It has been said that the bees which have been clustering outside will, all the morning of the day they are intending to swarm, go inside the hive; but this cannot always be so, for I have seen a swarm issue while the loafers were hanging on the outside as usual, and at the sound of the swarming note, they took wing and joined in. Where a colony is intending to swarm, they will not be working like the rest, as a general thing, and quite likely, on the day they are intending to swarm, very few bees, comparatively, will be seen going out and in at the hive.⁷⁷ With movable combs, we can generally give a very good guess of the disposition to swarm, by opening the hive. Bees do not, as a rule, swarm until they have got their hive pretty well filled up, and have multitudes of young bees hatching out daily. The presence of queen cells is generally considered an indication of the swarming fever, and it used to be supposed that there was no danger of swarming unless these were present in the hive; but since so many stocks of Italians have swarmed when nothing in the shape of a queen cell was to be found in the hive, the idea of removing queen cells, to

arrest or prevent swarming, has been to a great extent abandoned.

Many think that the clustering of the bees on the outside of the hives is an indication that they are going to swarm. To a certain extent this may be the case, but it is by no means an indication that they are going to swarm very soon. I knew a colony, belonging to a neighbor, that hung out in great masses nearly a month, before the bees came out. His new hive was in readiness, and he staid at home and watched day after day, until clover and basswood both were almost gone, and finally they cast a truly large, fine swarm.

NEVER ALLOW BEES TO HANG OUTSIDE THE HIVE.

This swarm had hung outside the hive during the great honey harvest of the season, and as it is no unusual thing for a colony to store 10 lbs. a day, during the height of the season, they had lost at least 100 lbs. of honey, for the swarm was an unusually strong and fine one. I think they could easily have secured this amount if they had worked, but it is by no means certain that they could have been made to go to work, as they did after they swarmed, and were put into a new hive. Within two or three weeks after they swarmed, if I remember, they filled their hive, and gave about 25 lbs. of surplus. How shall we deal with such bees? Well, it will be an excellent problem for our A B C class to work out by actual practice. One way is to put section boxes on the top and sides, and then drive the bees inside with your smoker, and thus make them go to work, if you can. If they will not do so, get from some other hive some sections partly filled, and this will generally accomplish the object. If the bees are in a box hive, and you cannot at the time transfer them (it is rather unsafe to transfer during a great honey yield, with the hive full of honey, you know), fix a new hive all right, move away your old box hive, brushing all the bees off on the ground, and then give them a queen or a frame of brood in the new hive, as in ARTIFICIAL SWARMING, and make them go to work at something. You can do it every time, although it may be a few days before they get over their stubbornness, and get to work fully. Sometimes a very large, new swarm will hang out, and refuse to work. I have several times made such go in and attend to business, simply by the use of a smoker. If bees hang out during the hot weather of Aug., after honey has ceased coming, you can still set them to

work by feeding, but unless you want more colonies, more combs built out, or can rear queens for sale, it may not pay to try to keep them at work. Towards night, after very sultry days, bees will sometimes hang out so as to cover their hives, and there may be no harm in allowing them to do this, although I should prefer to have them better occupied by doing something in doors. A really energetic colony will often be at work rearing brood at such a time, if they are gathering honey enough. Bees should always have room enough during the working season, to prevent their being crowded out, but we should not go to the opposite extreme, and give them so much that they feel cold drafts in their hive, and cannot keep up the requisite heat for comb building and brood rearing.

PREPARATIONS FOR SWARMING, TO BE MADE BY THE BEE-KEEPER.

Every apiarist, even if he have but a couple of hives, should make preparations for swarming, at least to some extent; for, even though artificial swarming is practiced, and the utmost care used to prevent any other, there will always be a chance that swarms may come out unexpectedly. Hives should be in readiness, and at least one should be fixed on the stand where you wish your next colony placed. Bank it round with cinders and sand, and fix as nice and level, as if it contained bees. Have some extra combs if possible, and have them placed in the honey house where you can put your hand on them at any minute; I would also have some hives where I could get a comb of unsealed larvæ, without very much trouble; that is, make up your mind what hive you are to go to, in case you should want such a comb in a hurry. Bees will often swarm on Sunday, and as we would not wish to work with our bees on the Sabbath more than is absolutely necessary, it behooves us to be at all times prepared to take care of a swarm, should it come, with very little trouble. I can remember having swarms on Sunday, when it became necessary to hunt up a hive, decide on its location, hunt up some empty combs, and then look over my hives to see where there was one with no surplus boxes on, that I might get at a brood comb with as little trouble as possible, to put in the new hive, to prevent them from decamping. All these things take time, and more than one swarm has departed while a hive was being made ready to receive them. If you keep the wings of your queens clipped as I have advised, you will need some queen cages where you can lay your hands on them at a min-

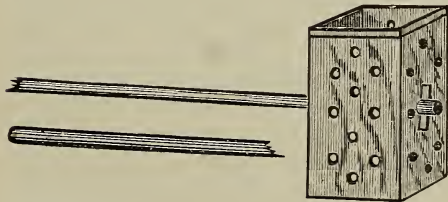
ute's notice, for there are times when you need to step about as lively as you would if a house were on fire, and you do not want to be bothered by hunting for things.

N. N. Shepard, of Cochran, Pa., gives a plan of an apparatus for living swarms, with some excellent instructions for using it. Below we give the letter with an engraving of the swarming box.

SWARMS AND SWARMING; HOW TO MANAGE.

For the first two or three years of my bee-keeping, when I had only from 10 to 30 colonies, I lost by having swarms leave me, also by having large first swarms go together when they came out nearly at the same time. After years of experience and practice, I have learned that I can prevent both their going to the woods and their going together; and for the last five or six years, though I have increased my number to 100 swarms and, some seasons, to 200, I have not lost a swarm, or had two large swarms get together; but this result I could never have reached, except by the help of certain implements which I use in swarming time.

With these, I can attend to 100 colonies as easily as I could to 20 without them, and, at the same time, be more sure of keeping them separate. With these, I can hive all my swarms and stand on the ground; I cut no limbs off, and I brush no bees from bodies and large limbs of trees. Let them swarm as fast as they please, 10 or 15 in an hour, I can take care of them, and keep them all separate, and it is only *fun*. I do not dread the "everlasting swarming."



SHEPARD'S HIVING BOX FOR SWARMS.

My hiving apparatus is a box made of $\frac{1}{2}$ inch basswood boards, about 8 inches square, by 16 inches deep; one end is closed, and the other open. This should be nailed together so as to be as strong as possible, then with a $\frac{3}{8}$ bit, bore it full of holes on each side. Put this on the end of a pole which is light and yet strong enough to let down a large swarm and not break. A straight grained pine or basswood stick $1\frac{1}{2}$ inches square will answer; take off the corners, bore a $1\frac{1}{4}$ inch hole through the center of the box, and fasten it on *tight*. Then you want a pole of corresponding length, with a strong hook *fastened* to the end of it. This is one set for hiving. I want 6 or 8 of these, if I have 80 or 100 colonies.

With these you need not wait for all the bees to light, but when one-half or one-third have clustered, hold the box close under them, and, with the hook, jar the limb once or twice, holding your box still, and you will soon have them all out and into it. Then if another swarm comes, carry off these, in the box, to a safe distance, or let them down and cover them closely with a sheet. The other swarm will nearly always light on the same limb. I have taken as many as 6 off the same limb, setting away the

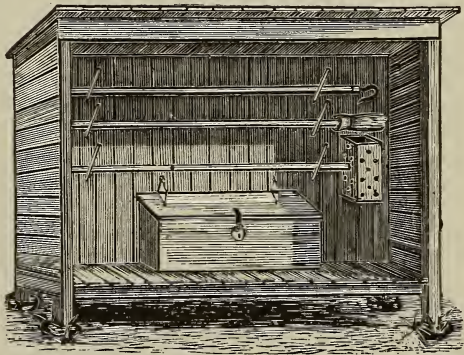
box with each swarm, until I could get time to hive them. Then, to prevent their lighting in places where they are hard to get at, and much time is required to hive them, I have one or two long poles with a bunch of grass tied tightly on the end. Put this in any place where they *first commence lighting* and keep it in motion for a few moments, and they will leave for some other place.

When the swarm is all clustered in the box, you can hive them at your leisure. Let them down carefully, holding the box horizontally until you get them where you want to shake them by the side of the hive or into it, then turn it so the open end is down, jar or shake them out just as you choose, and the work is done, only you must constantly be on the lookout for other swarms coming out to get with them. Have 3 or 4 good sheets where you can get them in a moment, if needed to cover a swarm.

N. N. SHEPARD.

Cochran, Pa., April 22, 1878.

The remark about having the sheets ready for covering the extra swarms, is excellent; and not only the sheets, but your poles, boxes, queen cages, empty hives, and everything which you have learned by experience you may need, should be kept in a neat, handy place, a small, neat shed, for instance, such a place as would be always easily "get-at-able," and would protect the utensils sufficiently from the weather. I think I will have our engraver give us a view of such a—



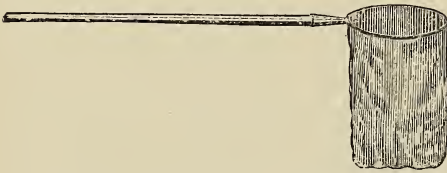
REPOSITORY FOR SWARMING IMPLEMENTS.

It is quite customary in hiving swarms, to spread a sheet in front of the hive, that the bees may have a clean path to walk in on. This white background also gives one an excellent opportunity to see the queen, and if they are too slow in getting into the hive the corners of the sheet may be raised, and, the bees shaken toward the entrance. As the fibre of the sheet gives them a chance to cling to it, I have liked much better, for this purpose, a large newspaper; for the bees can be shaken from it as readily, as if they had no claws with which to hang and cling to everything in the shape of cloth.

The bush or hiving box may be laid in

front of the hive, or the bees may be gently jarred from it in front of the hive, as may be most convenient; but with cross hybrids, I prefer the former way, for I have known them, at times, to take wing and leave when suddenly shaken on the ground, and at other times, they will take a notion to sting right and left. In this respect, the Italians are widely different from the common bees, for I have never known a swarm of the latter to make an attack or start off when shaken down in front of the hive. For these reasons, I would advise hiving the Italians, and especially hybrids, in as quiet a manner as possible, and, where it can be done, by letting them run into their hive at their leisure.

One of our hands uses an apparatus for catching swarms, as shown below.



The hoop is made of stout wire, and is about 20 inches in diameter. The ends are soldered into a tin socket that will receive a rake handle, or for tall trees, something still longer. The bag is to be put up under the swarm, and the hoop is then made to gently cut off the cluster so that the bees will fall into the bag. It is then turned edgewise, so as to confine them while it is taken down and carried to the hive. As the bag is made of cheese cloth, they have plenty of air. To get the bees out, turn it inside outward. The bag has the same diameter as the hoop, and is about four feet long. The whole apparatus would cost about 75c. This machine answers very well, where the cluster hangs straight downward, but where they get among the small limbs of trees, and in inconvenient places, the basswood box is the handiest, and I am inclined to give it the preference, as a general thing.

HOW TO HIVE A SWARM OF BEES.

The great secret of this depends much on keeping in mind the queer propensity, instinct, or habit which bees have when clustered together in swarming, of running eagerly into any cavity, box, or hollow that may present itself. It was this queer fashion that first attracted my attention to the subject of bees. I have mentioned the circumstance in the introduction to this book. My friend, when he started after the bees, picked up a rough box that lay near by, and

when they came to the ground, he simply set the box near them. Seeing the cavity or shelter offered them, they at once commenced humming, and traveled into it. My curiosity was unsatisfied, and I asked him how he knew they would go into the box. He said he knew they would because bees always went into a box or any similar thing that offered them shelter.

Their instinct seems to prompt them to seek any sort of a cavity, and this very point is the secret of the success of friend Shepard's swarming box. Those auger holes in the basswood box are sure to attract them, and they seem to enjoy hugely, the crawling in and then crawling out again, through the holes, beginning at once to claim it as their home, and being doubtless the better pleased with it because it has so many cool door ways where they can look out and get the fresh air in abundance, which they always need when the swarming fever is on them, and every bee is gorged with honey with which to commence provisioning the new home. In fact, their first act when getting ready to swarm, is to repair to the unsealed stores of honey and fill themselves with all they can contain. I do not know how they always behave after being thus filled, but in the few instances when I have been right on hand when the swarm issued, I have seen them commence to circle about the inside of the hive with uplifted wings, uttering the swarming note, until finally they began to issue from the hive. As they go tumbling out pell mell, hurry skurry, like a lot of urchins when school is out on a summer's afternoon, they seem, for the time, to have but one object in life, and that is to get as far and as speedily away from their home as possible.

HOW TO HIVE A SWARM WITH A CLIPPED QUEEN.

By turning to QUEENS, you will see that I have advised clipping the wings of every queen as soon as she becomes fertile; if we do this, our queen can not take wing, as she usually does as soon as she gets out of the hive (she is generally nearly the last to come out), but hops helplessly on the ground. If you are on hand, pick her up as soon as she makes her appearance, and cage her. As soon as the bees are all out, move the hive to a new stand, put a new hive in its place, and lay the caged queen down close by the entrance. The bees, as soon as they discover that the queen is not with them, will come back to their old stand, and enter the new hive. When they are going in nicely,

release the queen and let her go in with them. All this is very simple, and we have practiced the plan quite extensively. To let the new swarm go to work at once, and prevent any probability of absconding, we give them a single comb containing eggs and larvæ, and fill out the rest of the hive with frames of fdn. The bees usually commence coming back, in about 5 or 10 minutes, but they may cluster and remain away 15 minutes, or in extreme cases, as much as a half hour.

They will always come back sooner or later, so far as I have been able to learn, unless they have an extra queen, or get another queen by uniting with another colony, or something of that sort. See **ABSCONDING SWARMS**. If you do not find the queen as she comes out of the hive, and she has a clipped wing, you may be pretty certain that she will come back. **AFTER SWARMS** (which see) have unfertile queens, and consequently their wings can not be clipped. If you see them when they come out, and succeed in catching them, you can often live the swarms in the same way; but the young queen will sometimes put right out again, and you must expect her to show all sorts of eccentric maneuvers.

If you do not wish to move the old stock away, you can tie the caged queen to the end of a pole, with some leafy twigs near her, and usually succeed, without much trouble, in getting the bees to cluster around her. We have usually kept on hand for this purpose, a common rake, with a bush tied to the end of it. If they commence clustering on a limb, hold it near them while you shake the limb and keep it in motion, and you will soon have them on your rake, to be carried where you please. If your hive is already fixed, lay the rake on the ground in front of the hive, and the bees, finding the cavity, will at once commence to travel in. If they do not discover the entrance at once, guide them to it with a twig; after they are going in nicely, release the queen and watch to see that she goes in with them.

Very often, the readiest way of getting a swarm, especially if you are away from home and without tools, is to cut off the limb on which they are clustered and carry them where you like. If the limb is small, you can cut it with a stout knife; but if large, a saw will be needed. The teeth should be fine, that there be not too much jarring, and it would be well to make a slight cut first on the under side, that the bark may not hang when you get it nearly off.



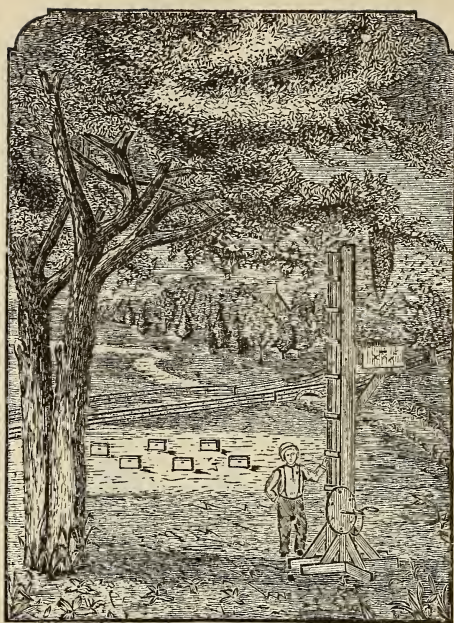
CARRYING HOME A SWARM OF BEES, BY SAWING OFF THE LIMB.

A small pruning saw, such as is shown in the picture, is very convenient for getting in between the limbs: if bolted to a pole, all the better. When the limb begins to fall, catch it with a pitchfork, or get some one to do it for you. If you catch it properly with the fork, you can let it down very quietly. I have carried a swarm of bees on a limb, $\frac{1}{4}$ of a mile or more, without any trouble. Where the limb cannot well be cut, or the cutting would mar a valuable tree, I often get a basket and tie some twigs to the bottom on the inside, then hold them over the cluster and with another twig, make the bees climb up into it, and carry them home, giving the owner of the tree a dollar or half a dollar for the bees, according to the season, or as we can agree.

HIVING BEES BY MACHINERY.

A friend sends us a model of a machine for taking down swarms. As it is ingenious and a curiosity, if nothing more, I have had our engraver make a copy of it.

The machine is made for hiving bees; it is 10 feet high, and can be made higher if wanted; it is so light that one man or boy can carry it easily, and it only costs a few cents to make it. Set it with the cross pieces on the ground, and with the little pulley up; then turn your crank so as to let the table for the hive slide down; put your bee hive on it, and



JACKEL'S MACHINE FOR TAKING DOWN SWARMS.

turn your crank until the hive is right up to the bees that have lighted on the tree or bush; put a pin in one of the holes to keep the crank from turning back, then get up on the ladder and start them to going in; when they are in, pull the pin out and let them down slowly, and set them where you wish to have them.

I had one in use during the summer, and I think it is real fun to hive bees with it. JOHAN JACKEL.
Bell Plain, Wis., Jan. 6, 1879.

I fear it is too much machinery, but we will let our readers try it if they wish, and they can then report.

TWO OR MORE SWARMS COMING OUT AND UNITING.

When the swarming note is heard in the apiary, it seems to carry with it an infection; this may be a mistake, but in no other way can I account for swarms issuing one after another, while the first is in the air, unless they hear the sound and haste to go and do likewise.⁷⁸ Of course, they will all unite in one, and as many as a dozen have been known to come out in this way, and go off to the woods in a great army of bees, before anything could be done to stop them. If your queens are clipped, and you "hustle around," and get them all in cages deposited in front of the hives, they will usually separate and each bee go where he belongs. Unless you have plenty of help, you will be unable to get the hives all moved away, and a new hive fixed for each one before they come back. In this case, they will go back

into their old hive, and, if the queen is released will sometimes go to work, but often, they will swarm out again within a few hours, or the next day, and if you keep putting them back, they will soon attack and kill their queen, and loaf about until they can rear a new one, and then swarm.⁷⁹ This is very poor policy, and we can by no means afford to have such work. If they swarmed for want of room, they may go to work all right, after having room given them. If they come out the second time, I should give them a new location, divide them, or do something to satisfy their natural craving for starting a new colony.

To go back; suppose they get a queen or queens having wings, and cluster in one large body. In this case, you are to scoop off bees from the cluster, with the swarming bag, a tin pan, or a dipper, as may be most convenient, and apportion parts, made about as nearly of the size of a swarm as may be, about in different hives. Give each hive a comb containing eggs and larvæ as before, and then get a queen for each one if you can. In dividing them up, should you get two or more queens in a hive, they will be balled as I have before described, and you can thus easily find them. If more than one queen is in a hive, you will find a ball of bees, perhaps the size of a walnut or hens egg, about them, and this can be carried to the colony having none. If you cannot tell at once which are queenless, you will be able to do so in a few hours, by the queen cells they have started. If you are more anxious for honey than bees, you may allow two swarms to work together, and if you give them sufficient room, you will probably get a large crop of honey from them, but this plan does not pay, as a general thing, because the extra bees will soon die off by old age, and your colony will be no larger than if the queen had had only her ordinary number of bees.

PREVENTION OF SWARMING.

If we can entirely prevent swarming, and keep all the bees at home storing honey all the season, we shall get enormous crops from a single hive. Whether we shall get more in that way, than from the old stock and all the increase, where swarming and after swarming is allowed, is a matter as yet hardly decided. If a swarm should come out in May, and the young queens get to laying in their hives by the first of June, their workers would be ready for the basswood bloom in July, and it is very likely that the workers from 3 queens or more would gather more

honey than those from the old queen alone. But another point is to be considered. The two or three new colonies must have stores for winter, and as it takes nearly 25 lbs. to carry a colony through until honey comes again, this amount would be saved by the prevention of swarming. Where one has plenty of bees and desires honey rather than increase, a non swarming apiary would be quite desirable. Then how shall we prevent swarming? We can do it very often, by simply giving abundance of room in the surplus receptacles, just as fast as more is needed, but no faster. This plan is the one generally in use. If the bee-keeper is on hand to look after his bees carefully, he will get along very well usually. But suppose he is not on hand. In that case, if the queen has both her wings, she will go with the swarm and cluster. If the queen is clipped, she will hop out on the ground and may stay near the entrance until the swarm commences to go back, when she will be attracted by their humming and go in with them. After watching their maneuvers many times, I am inclined to think that, in such cases, about half the queens get away and are lost, when no one is near to direct them. In case the queen is lost, the bees come back to the hive, and do little or nothing until a new queen is hatched, and then swarm again. This is a great loss, for the use of a good queen a week or ten days, in swarming time, to a populous colony, might be equivalent to a swarm of bees; besides, if the bees were at work in the boxes, almost all work would be suspended until they were again in possession of a queen.⁵⁰ To prevent this loss, Mr. Quinby invented what is called *A Queen Yard*.

This was a little box, perhaps 20 inches square, with sides 4 in. high. On the top edge of these sides tin was nailed, so as to project inward perhaps 1½ inches. This was so placed before the hive that the entrance opened directly into one side of the yard. The bees, when at work, came out into it and took wing. When they swarmed, they took wing without any trouble, but the queen, after trying to fly, would try to crawl up the sides, and could not on account of the tin ledge. She could only get back into the hive, which she would be sure to do about as soon as the bees got back. I believe these worked all right, except that they were cumbersome things to have about in an apiary, and that the bees often killed the queen after trying several times and finding she was never with them.

Before we had Italians, it used to be considered that cutting out all the queen cells, as fast as built, was a preventive of swarming. But as Italians often swarm without any sign of a queen cell, the plan has been pretty universally dropped. Cutting out all the queen cells except one, after the first swarm has gone out, will of course prevent any third or fourth swarms from coming out, if you are careful not to overlook any cells. See AFTER SWARMING. I believe, however, that this plan is not much in vogue at the present time. Perhaps it is because, where colonies are in the habit of being overhauled enough to perform such operations, artificial swarming is made to take the place of natural swarming, or what is still better, a judicious combination of the two modes is practiced.

A few years ago, it was quite common to talk of non-swarming hives, and there were many inventors who claimed to have accomplished the end desired. The most of these hives were covered by a patent, and they have gone the way of most, if not all, patented bee hives. Giving the bees abundant room, both over the cluster and at its sides, will do very much towards making a non-swarming hive, but they will swarm occasionally, in spite of us. Keeping the hive well shaded, or having the walls entirely protected from the sun, will do much to discourage swarming, and the chaff hive has for this reason proved about as good a non-swarmers as any brought out.

PREVENTION OF SWARMING BY THE USE OF THE EXTRACTOR.

Without doubt, the greatest reason for swarming is that the bees have got their hive full of honey, and there is no more room for them to labor to advantage; accordingly queen cells are started, and other preparations made, and they get, as we say, the swarming fever. Now, if their honey is taken away, and more room given them, before they have begun to feel cramped for room, they will seldom get this swarming fever.⁵¹ This room may be given by taking out combs filled with sealed honey, and substituting empty combs or frames of fdn., or it may be done by extracting the honey. This latter plan, I believe, is most effectual, for almost every drop of the honey can be taken away by extracting. We extract from the brood combs as well as from the rest, and this can be done without any injury to the brood, if we are careful not to turn so fast as to throw out that which is unsealed. I would only do this, however, in extreme

cases, where the bees will not work, and are determined to swarm. The honey around the brood is generally needed there, and would better not be removed. It should be remembered that this remedy to prevent swarming is not infallible, and I do not know that any one is, at all times. I have known a swarm to issue the day after extracting all the honey I could get from the hive, but they had probably got the swarming fever before any extracting was done. At another time, the bees swarmed while I was extracting their honey.

KEEPING BEES IN UPPER ROOMS AND GARRETS.

This plan for keeping a single colony, to furnish honey for the table simply, has been in vogue for perhaps centuries back. If the room is small, and made perfectly dark, the hive being placed back a few feet from the entrance in the wall, the bees will seldom swarm. One or more sides of the hive are generally removed, and the bees build their combs on the outside of the hive, or against the walls of the room, where the owner can go with knife, plate, and smoker, and cut out a piece for the table, without opening any hive, or disturbing anybody. In fact, he can consider this his "honey room," and leave the honey stored there year after year, if he chooses. When a friend calls, he can say, "Will you have a slice of new honey? or will you have one a year old? or two years old?" He might even have it ten or a dozen years old, for aught I know, if he has a taste for antiquated honey. Would not such a honey room be nice? While writing about it, it has occurred to me that a room of this kind, fitted up with all modern appliances, might be a very pretty and a very useful thing. With the experience I have had in the house apiary, however, I am inclined to think that, where there is so much room, there would be a great disposition in the bees to loaf and cluster on the sides of the room, in the shade, instead of going to work. Now for the objections.

If the hive and honey is close by the entrance, the bees will swarm as much as in the house apiary. If it is a yard or more back from the wall, the bees, not being able to take wing in the dark, will crawl all this distance on foot, which would prove a great loss of time and strength, and consequently, of honey. Providing the plan succeeds, you get a good crop of honey year after year, it is true, but you have all the time only the efforts of a single queen. While your honey increases, your gathering force is no more,

after the lapse of 10 years, than it was before. If one colony is all you want, this may be all right. The queen cannot live more than three or four years, and at her demise a new one must be reared and fertilized. For some reason, I know not what, she is very often lost, in these garrets, and the colony dies of queenlessness. Worst of all, they will often swarm, and keep swarming, until nothing is left of them; but I believe swarming is rather the exception, and not the rule. Now who will have the nicest honey room, close to, or adjoining the pantry? Have it so your wife can cut out the honey any day in the year, without saying a word to anybody. When it is all in nice working trim, send me a description of it.

DO BEES CHOOSE A LOCATION BEFORE SWARMING?

We have ample proof that they sometimes do, but whether such is always the case or not, we have no means of determining positively, so far as I can see. It is my opinion that, although they usually do so, there are many exceptions. When a swarm of bees catches the fever by hearing the swarming note of a neighboring colony, it seems difficult to understand that they could have selected their tree, and made the same provision for housekeeping that the first one may have done. The proof of this has been given many times through our journals. A neighbor of ours once saw bees going in and out of a tree, and supposing of course that it contained a colony, went with his boys the next day, and cut it down. It contained no sign of a bee. While they were standing still and wondering at this strange state of affairs, the boys doubtless joking their father about his seeing bees where there were none, lo! and behold! a swarm appeared in the air. They came to the very spot where the now prostrate tree had stood, and seemed as much astounded as a colony whose hive has been moved away. After some circling around, they clustered in a neighboring tree, and were lived. They had selected this as their home, it seems, and an advance party had gone ahead the day before, to clean out and fix the hollow ready for the swarm, and it was these house cleaners that my friend saw at work. I gave the above in GLEANINGS a year or two ago, and a large number of corroborating instances were furnished by our readers. The number of bees that go out to look up a location is not usually great, but they may often be seen about swarming time prowling about old hives, and hollows in trees, as if they were looking for some-

thing. After awhile, swarms come and take possession of these places, if they seem suitable, and of late, a hope has been expressed through the journals, that we might take advantage of this disposition and fix hives so attractive, that the bees will come out, select the "house and lot" that suits their taste best, and then, when they get ready, "move in." When this is accomplished, we shall have automatic swarming.

DECOY HIVES.

Many of the friends have followed out the idea given above, by locating hives in the forests, in the trees, and such hives have in many cases been quickly accepted and appropriated. I believe we are indebted to Mr. J. H. Martin, Hartford, N. Y., for first suggesting the idea. Hives left standing on the ground in the apiary have many times been selected by swarms, and, if I am correct, the bees, in such cases, often come out of the parent hive, and go directly to these hives without clustering at all. I have suggested, through our journal, the possibility that hives could be so arranged that the bees would be attracted by them, and use them instead of going for the woods. When this shall be successfully done, I think it will be a great achievement, and even if we succeed in securing only half of the runaway swarms, it will be no inconsiderable item.

AUTOMATIC SWARMING.

From what has been said, it will not take much of a jump of the imagination, to conceive of a hive so arranged as to swarm itself, mechanically. We usually keep a hive suspended on a spring balance, with the white dial so placed that the amount of honey gathered each day can be seen at a glance, even when only passing near the apiary. On coming to dinner one day, the dial showed that the hive had lost instead of gaining, and the loss amounted to exactly 8 lbs.; you see, this was the weight of the swarm which had issued during the forenoon. Of course, the hive rose an inch or two, after having been lightened so much. Well, the same idea has been used in connection with Quinby's queen yard for automatic swarming. The hive must first be made double; that is, an empty hive is fastened to the one filled with bees, and the two are balanced on a pivot. A weight is added to the empty one each morning, and suitable slides are so arranged that when the swarm goes out, the hives tilt, opening an entrance into the new hive, and closing the old one. The queen, having her wings

clipped, is confined in the queen yard; the bees rush back on missing her, and their old entrance conducts them right into the new hive, the queen following in with the rest. I believe this machine has been brought into shape so as to work in practice, but, like many other things, the amount of machinery required for each hive, and the labor of adjusting the weights each morning, on every hive, more than balances the trouble of hiving, and the possible loss of swarms which issue in the old way.

Another automatic swarmer has been invented and brought into practical use, by D. A. Jones, of Beeton, Ont., Canada. This is based on the principle, or rather the peculiar habit which swarms have, of alighting on the same spot or limb, on which other swarms have alighted before. Where many hives of bees are kept, it is well known that after one swarm has clustered on a certain limb, others are apt to choose the same spot, and often, nearly every swarm of the season, by some strange instinct, will take to that very limb, as soon as they leave the hive.

After having watched a great many times to discover the cause of this queer behavior, I decided it came about thus: As soon as a swarm issues, straggling bees scatter about in every direction, and while the air is full of them, you may see individual bees scanning and hovering about all the twigs and shrubbery for rods around. Well, if a swarm has clustered on one of these twigs or limbs, and a bee should come very near the spot, he would catch the scent of the queen, from her having rested on the spot, even were it a week before. See *ODOR OF QUEENS*. Well, as soon as he catches this, he gives a call, and other bees rush to the spot, and the probability is, the whole swarm will soon be clustered on this very limb. After this, the chances are double, that the next will alight there, and so on. Aside from the odor of the queen, the limb almost always has bits of wax fastened to it by the bees, while hanging there, even if they hang clustered not longer than fifteen minutes.

Our friend Jones fixes something like an old fashioned well sweep; that is, a pole balanced in a fork, so that its smaller end is high in the air, while the other rests on the ground. On this heavy end, is fixed a box to contain stones for ballast. At the other, is what is sometimes called a bee-bob. This may be a bunch of hay, or a bunch of green leaves. I have heard of using a black stocking on a pole, to cause the bees to light on it.

Mullein-heads dipped in ink, so as to imitate a swarm of bees, are also recommended. Perhaps the best thing is a ball made by stringing dead bees on a string with a needle, and then winding it about some substance about the size and shape of a swarm, letting some of the strings hang down. Well, suppose you put stones in the box, until about 5 lbs. on the bee-bob would cause it to sink with a moderate speed. If a swarm should cluster on this bob, it would be let down automatically, as soon as the weight was sufficient. A stop is arranged at the proper point, to stop the pole and shake off the bees, and, as a matter of course, a hive is set right at the proper point for them to run into it. If they go back to the bee-bob, it will let them down again; and so on. Furthermore, our ingenious friend has a bell and pistol fixed to the post, so that one is rung, and the other discharged, to let the apiarist know that his bees are safely in the hive, ready to be placed where he wishes. Many of these machines have been put up, but I believe few succeed with them, as does friend Jones, principally for the reason that the first swarm can not be made to use the bee-bob, in preference to some place suiting their own fancy. I give these plans, that you may know what has been done.

RINGING BELLS AND BEATING PANS TO BRING DOWN A SWARM OF BEES.

The books, of late years, have seemed to teach that this practice is but a relic of superstition, and that no real good was accomplished by the "tanging," as it is often called. Perhaps it usually has no effect in causing them to alight, but from watching the habits of swarms, I am inclined to think otherwise. Those in the habit of seeing queens on the wing are generally aware that the note they give when flying is quite different from that of a worker or drone, and many times, when a queen has escaped while being introduced, I have detected her whereabouts by the sound of her wings, before I had any glimpse of her at all. With a little practice, we can distinguish this note amidst the buzzing of a thousand bees flying about, so as to turn our eyes upon her when she is quite a distance away. Is it not likely that the bees composing a swarm know this sound as well as we do, or much better? Again; a swarm of bees usually has scouts to conduct them to the tree, or other place of their chosen abode, and it is quite likely they follow these scouts and know of their presence, as they do their queen, by the sound they emit from their wings. A noise,

if loud enough, would be likely to drown these sounds, and thus produce disorganization. Throwing dirt or gravel among them will bring them down generally quite speedily, and I suppose it is because it produces disorganization much in the same way.

Throwing water among them is thought to be more effectual than either the sounds or the dust, and it has been suggested, that it is because they think a shower is coming up; but I am inclined to think it is more the disorganization, and perhaps also the wetting of their wings, that makes them hurry to cluster on the nearest object. If a pail of water is near the apiary, and a dipper handy, swarms that do not seem inclined to cluster may usually be made to do so without trouble. As it is difficult to throw water with a dipper as high as swarms often fly, and in the fine spray that seems most effective, a small, hand, force pump, or fire engine, has been used, and seems to answer the purpose most effectively. With a pail of water on your left arm, and the fountain pump, as it is called, in your right hand, you can chase after a swarm if need be, and with the attachment for giving a fine spray, you can wet their wings, if they threaten to be stubborn, so that they *must* come down.



As this fountain pump is a most valuable implement to have around for a great variety of other purposes, to say nothing of fires, I think the investment a very judicious one for the bee-keeper. In one case, our honey house took fire from the stove pipe, after we had been making candy, and a fountain pump saved the building after the fire had burst through the roof. The whole apiary would have suffered much, and much of it been entirely destroyed, had not the fire been extinguished in the building.

Many claim that absconding swarms can be stopped by flashing across them the reflection from a looking glass. This has been explained by saying they take it for

lightning, and stop, thinking that a storm is coming. I am inclined to think the true solution of this and other means used to bring down swarms is that it disturbs and disorganizes the body, thus causing them to alight.

In concluding the subject of swarming, I would ask the reader's attention to some excellent articles on the subject, written by G. B. Peters, of Council Bend, Ark., and given below.

NATURAL SWARMING AND ITS ATTENDANT CLUSTERING.

When bees swarm naturally, why do they collect together on some object and not fly directly to the woods after leaving the parent hive? This was a question which excited my juvenile attention when I was 10 years of age.

The ancient and honored custom of ringing bells, beating on tin pans and other sounding things, I had often noticed, and to my childish mind it appeared to be all important in stopping the swarm when on the wing. It happened that the family were absent at church, on one occasion, and I at home lolling on the greensward or playing among fruit trees and roses, when the bees swarmed and clustered as readily as they could have done if all the Callithumpian troupe had been there on duty; and I had the pleasure afterwards of boasting to papa that I had hived the bees without noise or assistance. He said some persons borrowed excitement from the agitation and roaring of the swarm, and rang bells more from an ecstatic impulse than from a sense of its necessity; and he had no objection to such persons thus enjoying themselves, but that it had about as much to do in settling bees as the jargon of trumpets, gongs, and horns used by the ancient heathen, had in frightening away the evil genius that eclipsed the sun, as they supposed. It was manifest to my young mind that there was a cause for bees fixing on bushes or other objects, and, after observation, I established the fact, long before Langstroth threw out the suggestion, of a reconnoitering party.

The bee is impelled in all its operations by instinct alone, which in some cases is so remarkable that some authors have attributed to it the power of rational conception.

When a swarm issues from a parent hive, either with an old or a young queen, they appear confused until they cluster, when they become docile and quiet. Why did they cluster there? Because they were homeless little wanderers, and instinct directs them to sojourn awhile until a set of explorers shall have discovered some cavity in cliff or tree, suitable for a future habitation. A number of scouts, varying from 30 to 50, leave the swarm before it is fairly settled, to explore the country in search of a cavity suitable for the propagation of their species, which is the end and aim of all insect creation. If these scouts are not successful, the swarm may be hived and permitted to remain in the same place and do well; but if they are successful, and on returning find the swarm where they left it, or near the place, they will immediately lead it away. Queen, workers, drones, all take wing, rise high in the air and abandon old home, kin, and every thing, forever, and no effort of the bee-keeper can arrest them. This result of a successful scout is as sure to transpire as night to follow the day.

Perhaps one in a hundred will go straight to the forest without fixing on anything, but in such cases they have been delayed from some unknown cause in swarming, been lying outside the parent hive, and have selected their home before issuing forth. I have seen that occur three times myself, and they move differently from the absconding bees that have clustered before starting. Now those runaways went straight out of the hive to a hollow tree, moving slowly and near the ground, scarcely above your head and I followed all of them to their place of abode, once on foot, twice on horseback and very easily kept pace with them; they took a "bee line" from the hives to the hollow trees not exceeding a half mile off. I suppose all such have found a hollow near by. I noticed a revolving lot of bees in each, about five feet through, leading the van with a hissing sound not unlike the sound of bees when exasperated. That sound is in plain contrast with the roaring of the great body of bees that follow in the rear, and it is that peculiar sound that makes bees frantic with the impulse to follow it, so that they can not be prevented short of actual destruction.

I will remind the reader here that bees have different sounds to accomplish different ends. The only natural sound of bees on the wing is that produced by the returning laborer when she comes, at even, laden with spoils collected from some flowery field. Who has not been charmed by such industrious energy, as those mellow tones died in the entrance of the hive? The shrill note of the pugnacious defender of the hive is familiar to every child. The sharp sound of bees just beginning to lead out a swarm heralds its advent to the apiarist and is very different from the two former sounds. The coarse bass roaring of the swarm before it begins to cluster, is only heard when they are in search of the queen, and is kept up by both workers and drones; then follows the sharp cutting sound as they begin to cluster, to call the colony together, which is well known to the bee-keeper as the signal of congregating. Then the shrill hissing sound of the escort that leads them to the woods blends with the roar of the rear part of the swarm, making a strange compound heard only from absconding bees. Then again, in that "happy hour" when they have found a house, we hear the happy hum made by a peculiar position of body and indicating peace and contentment. Also a sound of distress, when annoyed by smoke or enemies, rings through the hive, and no wail of misery from any other insect tribe can equal it. Finally, we have the ventilating sound at the entrance and all through the hive, which in hot weather may be heard quite a distance. All these different sounds are instinctively associated with certain purposes, and the movements of the queen are generally governed by them. She thus follows certain sounds as do the whole colony. She never leads the swarm, but is attracted by the roaring mass, and when she enters a new hive there follows an air of quiet, which security induces. If she is lost or has stayed, after awhile her faithful children will leave the hive and in wild confusion look for their mother, giving out a sound of despair differing from all other sounds.

In settling this dense forest country (Mississippi river bottom) I deadened large tracts of land for future cotton fields. I found many bee trees in these deadenings when divested of foliage. In winter time, I would cut them down, saw out a segment of

the tree, including the hive when it was not smashed by the falling, place them upright as they originally stood, and leave them to swarm next spring. Having 40 or 50 such stands, I made a specialty of seeing them every day between 10 and 2 o'clock, during swarming time, and saved many new colonies. In riding one day through the deadening, I heard the shrill noise of escort bees and soon discovered about 50 circling about a tree, ascending to the branches, then going to the nearest tree and circling, descending to the very roots, and continuing ascending and descending from one tree to another, taking in saplings even, until I was led by them unconsciously to one of my bee tree colonies, and there hung a swarm in the bough of a small tree, and into that swarm they went. I was sure that was a band of bee scouts and, believing they had returned without finding a hollow tree, I hived them, and to test my theory let them remain on the spot. They did well. Thus I deduce the following conclusions which I know to be practically useful to the bee-keeper who prefers natural swarming: 1st, they cluster to afford opportunity for the explorers to find a new habitation. Many times they fail to find one, and in *that case alone* the new hive may be permitted to remain where they clustered; but if the explorers find a home, they conduct the whole colony directly to it. 2d, as the swarm is watching for the return of scouts, it is necessary to hive them without delay, and as soon as they are quiet remove them a distance from that place so as to thwart the returning scouts. 3d, the new colony will never flee to the woods unless the scouts conduct. I have kept a regular account running up to one hundred and eighty-two colonies thus treated and never had one to leave the hive. There are apparent exceptions; for instance, a colony clustering in the full rays of the sun on a hot day, will be driven off by its scorching rays to seek a more congenial resting place. Another exception is where bees, in a dry, sterile country, if they ever swarm at all, are almost sure to take wing, in order to find a more favored region where their instinct suggests that the pabulum of bee life may be more abundant.

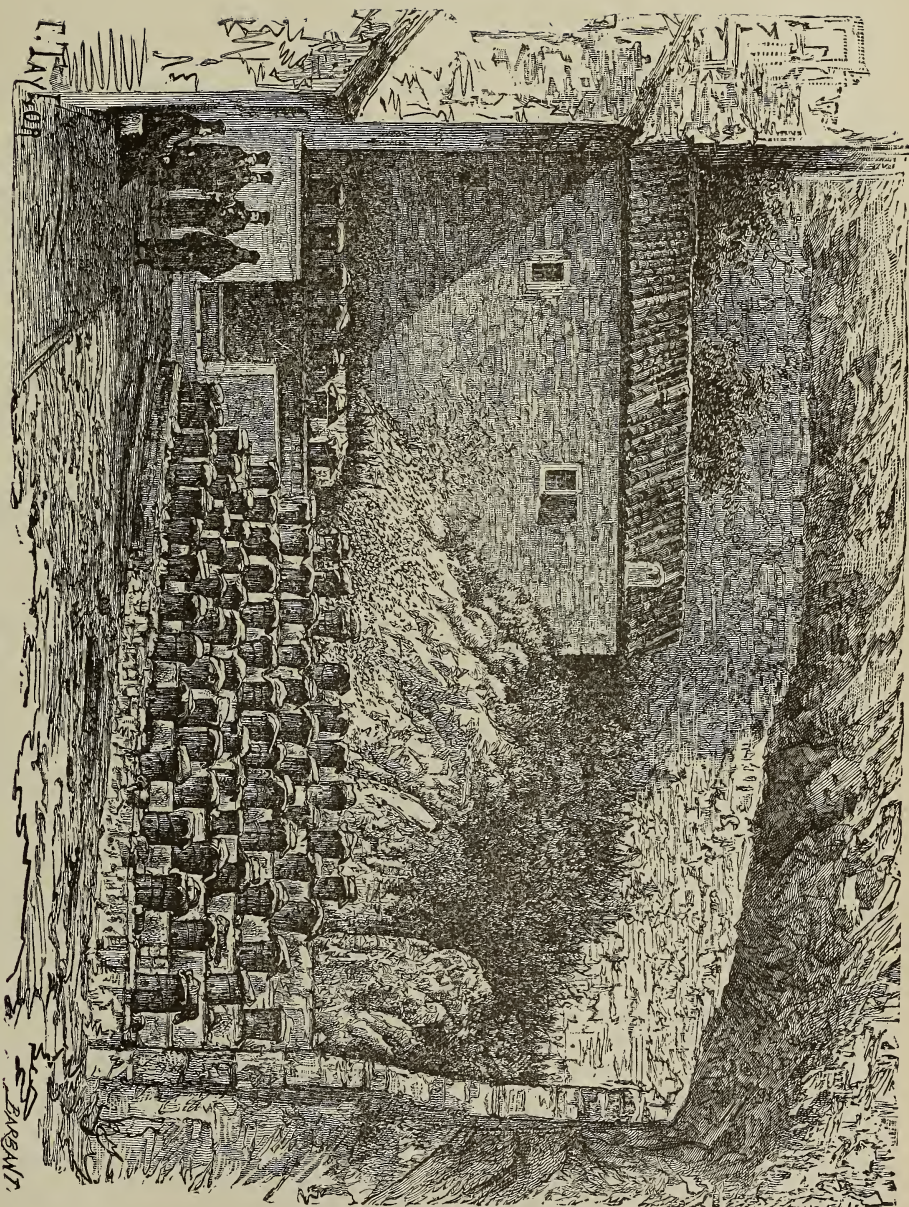
HIVING A NATURAL SWARM OF BEES.

Fifty years ago the common bee hive of the pioneer was a segment of a hollow tree, with a board on top and sticks across the centre, to prevent the new comb from breaking down when filled with honey or brood. Next followed the box hive finished somewhat after the fashion of the gum hive. From the first came the appellation of "bee gum." To introduce a natural swarm in either of these, is most easily done by hiving from above, and not from below as my "illustrious predecessors" did. This is readily effected by inverting the hive and placing the open mouth immediately under the swarm and almost in contact with it. If they have clustered near the ground, place the hive on the ground, and as the height varies, vary the resting of the hive, say on a bench, box, barrel or any object so as to obtain that relative position of bees and hive. If high up on the branch of a valuable fruit or ornamental tree, draw up the hive and lash it to the branch or some other object to make it secure; then a sudden jar by tapping the limb or other object will precipitate the whole swarm to the lower end of the hive. Cover the mouth of the hive

with a board leaving two inches open. Immediately upon finding themselves in a dark room, they set up that "happy hum" indicating delight instead of fright, and all the bees that happen to miss the hive will make a rush for it, nay, they can not be kept out unless the mouth of the hive is entirely closed up. After a half minute's rest to enable the bees to get a footing, the hive is to be gently raised and placed in an upright position, and in five minutes more it can be removed to its permanent locality where they will begin the career of a complete colony.

If the swarm is high up on the body of a tree or any object not susceptible of the "sudden jar," I lash the hive securely to the tree or limb and with the quill end of a turkey's feather, detach as much of the *lower* part of the swarm as I can, letting it fall in the open hive as before. I say lower part of the swarm for there the queen is always to be found in a clustered swarm. I then put on the closing board, the roaring is instantly started in the hive and then I gently brush all the bees off the tree, not caring where or how they fall as they are sure to go to the sound in the hive. When they cease to return to the tree I lower them down, upright the hive, and in a short time place them on their parent stand. Upon the same principle I hive bees in my triangular hives or in movable frame hives, with this difference: I do not invert these hives, but I bring the top of the triangular hive in contact with the swarm, and the slots for the honey boxes just underneath them, or I take out the centre frame of such a hive of any construction and place it as I do the triangular hive; then with the quill end of said turkey's feather detach about one-third of the swarm, dropping them in and through the slots or frames as the case may be, gently pushing in, with the feather end, all the bees that lodge on top of the hive. In an instant that welcome roaring is started, when I displace the balance of the swarm, which, lodging on top of the hive, rush to their companions' welcome. When the whole energy of the swarm is directed to the inner hive, I close honey slots or replace the movable frame and cut off connection through the top. They then make for the entrance, calling in all absentees, and in a few minutes the new colony is placed in the apiary. It is the simplest process in the world to hive a natural swarm of bees, if they are managed with patient gentleness and not irritated by rude treatment. Thousands of men think they know how to hive bees, and yet the use of the veil and gloves proves they do not comprehend the nature of the insect. I can hive a half dozen swarms in the time required to make an artificial colony. In fact, it can be done sooner than described, and there is no earthly necessity of using veils or other protective means. With this mode of hiving a natural swarm or with any other mode, *the most important part of the whole transaction is to remove the hive as soon as the confusion of hiving is over and the bees quiet*, to some other locality in order to avoid the returning scouts whose explorations of the forest for a hollow tree, may have been successful. If so, whether they find the swarm in the place they left it, or in a new hive, they will as surely take the colony off to the woods as effect follows cause in any other operation of their economy. GEORGE B. PETERS.

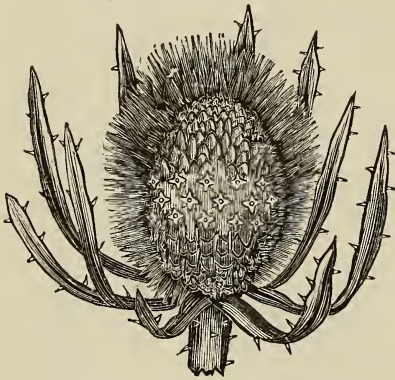
Council Bend, Ark., Sept. 22d, 1876.



AN APIARY IN CETIGNE, MONTENEGRO, TURKEY.

T.

TEASEL (*Dipsacus*). The Greek name of this plant signifies to thirst; because the heads, after flowering, are of a porous nature, and "drink" large quantities of rain water. On account of this property, the heads are often used to sprinkle clothes, before ironing. They take up the water, and, when shaken, throw it out in a spray.



TEASEL (*Dipsacus Fullonum*).

The variety that produces honey is the one used by fullers in finishing cloth, and hence its name, *D. Fullonum*, or Fullers' Teasel. This plant, like the buckwheat and clover, is raised for another crop besides the honey, and therefore may be tested by the acre without so much danger of pecuniary loss, should the honey crop prove a failure. Our friend Doolittle pronounces the honey remarkably white and fine, but some others have given a somewhat different opinion.

From what I can learn, I am inclined to think teasel does not yield honey every year; it grows in considerable quantities by the road sides and in waste places in our locality, but I seldom see bees on it, at all. Perhaps acres of it under high cultivation might make a great difference, as it does with any other plant.⁸² The following letter from G. M. Doolittle, of Borodino, N. Y., gives a very full account of the method pursued in its cultivation.

The plant is biennial as a rule, although a part of the plants (the smaller ones) may not produce heads till the third year, and in that case they are called "voors." The ground is prepared much the same as for corn, being marked but one way, the rows being from 3 to 3½ feet apart. The seed is then sown, and as a rule, left for the rains to wash the dirt over it, as it is sown as early in the spring as the ground can be worked. Some, however, slightly brush the seed in. The plants, when they first come up, are very small, and the first hoeing is a tedious operation, being about the same as that required for beets or carrots. The plants are hoed, or *should* be, three times. Farmers usually raise a part of a crop of beans or turnips with them the first year. One heavy draw-back on teasel culture, is that they are very liable to winter kill by having a thaw, and the weather turning cold suddenly, so as to freeze the plant when there is water in the crown, which entirely destroys it. An open winter is very bad for teasels. The second year, during the month of May, they are passed through with a cultivator, and slightly hoed, when they are left to run, as it is termed. The "kings," as they are commonly called, are heads at the top of the stalks, and commence to blossom about July 10th, continuing in bloom about a week or 10 days, opening first in the centre of the head, blossoming toward the tip and base, and ending off at the base. As soon as the blossoms fall off they are cut, cured, and shipped to manufacturers for the purpose of taking the nap from cloth. The "middlings" as they are termed, commence to blossom when the kings are about half through, and the "buttons" come last, making from 20 to 25 days of bloom from the commencing of the kings to the ending of the buttons. The middlings and buttons receive the same treatment as the kings, and all are mixed and sold together. They are sold by the thousand, 10-lbs. making a thousand. An acre will yield from 100 to 250 thousand. At present they bring about 75c. per thousand, but years ago the price was from \$2. to \$5.00. Bees work on them all hours of the day, and no matter how well basswood may yield honey, you will find them at work on the teasel at all times; and I have never known teasel to fail to secrete honey except in 1876.

The honey is very thin, and much evaporation is required to bring it to the consistency of basswood honey when first gathered. We have many times thought, if teasel could come just after basswood, it would be of great value; but, coming as it does *with* basswood, it is of no great advantage, except that it usually lasts from 6 to 8 days after basswood is past.

G. M. DOOLITTLE.

Borodino, N. Y., Dec. 10th, 1877.

TOADS. These, without question, are an enemy to the honey bee. They usually plant themselves before the entrances of the hives about night fall, and, as the heavily laden bees come in, they are snapped up with a movement that astonishes one who has never witnessed it. His toadship sits near the alighting board, with an innocent, unconcerned look, and, although you see a bee suddenly disappear, it is only after you have repeatedly witnessed the phenomenon, that you can really believe the toad had anything to do with it. By observing very closely, however, you will see a sort of flash, as the bee disappears, accompanied by a lightning like opening and shutting of his mouth. The bee is taken in by his long tongue, and I should judge that he is capable of striking one with it, when as much as two inches distant. I do not know how many bees it takes to make a meal, but I do know that toads will often become surprisingly thick about the hives during the honey season, if they are not driven away by some means. I have been in the habit of killing them, but I must confess, my feelings revolt at such severe measures, and I much prefer the plan given by a friend, as follows:

During last season, I noticed large numbers of toads hopping about my apiary, and having often seen them eat bees, I devised a plan to dispose of them as follows: I made a pair of wooden tongs, and with a deep tin pail, I went into the apiary just after sundown one evening, and, in a short time, picked up, with the tongs, 32 toads; and it was not a good day for toad hunting either. Well, what should I do with them? I did not really like to kill them, so I took them on to the bridge and dumped them into the Tuscarawas river, telling them to swim for life. About a week after that, I disposed of 16 more in the same way.

A. A. FRADENBURG.

Port Washington, O., Nov. 3, 1879.

TRANSFERRING. I firmly believe every one of our readers can do their own transferring, and do it nicely, if they will only make up their minds that they *will* succeed. If you are awkward and inexperienced, it will take you longer, that is all.

It has so often been said that the best time is during the period of fruit blossoms, that it seems almost needless to repeat it. Be sure that you have cleared away all rubbish from about your box hive or gum, for a space of at least 6 feet all round. We would decidedly prefer to have the hive stand directly on the ground with all rough and uneven places filled up with sawdust nicely stamped down. Make it so clean and tidy that you can find a needle if you should drop it, and be sure you leave no cracks or

crevices in which the queen or bees may hide or crawl. Make all these arrangements several days beforehand if possible, so that the bees may be fully acquainted with the surroundings and be all at work; remember we wish to choose a time when as many bees as possible are out at work, for they will then be nicely out of the way. About 10 o'clock A. M. will probably be the best time, if it is a warm, still day. Get all your appliances in readiness, everything you can think of that you may need, and some other things too, perhaps. You will want a fine-toothed saw, a hammer, a chisel to cut nails in the old hive, tacks, and thin strips of pine (unless you have the transferring clasps), a large board to lay the combs upon (the cover to a Simplicity hive does "tip top"), an old table cloth or sheet folded up to lay under the combs to prevent bumping the heads of the unhatched brood too severely, a honey knife or a couple of them (if you have none get a couple of long thin-bladed bread or butcher knives), and lastly a basin of water and a towel to keep everything washed up clean. Now, as I have said before, this is really, a great part of it, women's work, and if you cannot persuade your wife or sister, or some good friend among the sex to help, you are not fit to be a bee-keeper. In saying this we take it for granted that women, the world over, are ready and willing to assist in any useful work, if they are treated as fellow beings and equals. The operation of transferring will afford you an excellent opportunity to show your assistant many of the wonders of the bee-hive, and in the *role* of teacher, you may discover that you are stimulating yourself to a degree of skill that you would not be likely to attain otherwise.

A bellows smoker will be very handy, but if you have not one, make a smoke of some bits of rotten wood in a pan; blow a little smoke in at the entrance of the hive, but do not get the sawdust on fire. Tip the old hive over backward, and blow in a little more smoke to drive the bees down among the combs; let it stand there, and place the new hive so that the entrance is exactly in the place of the old one; put a large newspaper in front of the new hive and let one edge lie under the entrance. The returning bees, laden with pollen and honey, are now alighting and going into the hive and rushing out again in dismay at finding it empty; we therefore want to get one comb in for them, to let them know that it is their old home. Move the old hive back a little farther so as to get

all round it, and give them a little more smoke whenever they seem disposed to be "obstreperous;" and now comes the trial of skill and ingenuity. The problem is, to get those crooked, irregular combs out of that old hive, and then to fix them neatly in the movable frames as in the cut on next page.

Your own good sense will have to dictate much in this matter. Saw off the cross sticks, if such there be, and with your thin knife cut the combs loose from one side; cut off the nails and pry off this side, but don't get the honey running if you can help it. We have as yet said nothing about bee veils, and though we keep them to sell, I really do not think you need one, *unless* you are so careless as to get the honey running and start robbers. When the side is off, you can probably get one comb out. Lay it on the folded table-cloth, take out the comb guide, lay the frame on it, and let your feminine friend cut it so as to require that the frame be sprung slightly to go over it. With the clasps she can cut and fasten the combs in as fast as you can take them out; if sticks and tacks, strings or rubbers be used it will take some longer. When the frame is to be lifted into a horizontal position, the board, cloth and all is to be raised with it. With the wash basin and towel, keep the honey neatly wiped up. If robbers begin to annoy cover both hives with a cloth while you are fitting the combs, and keep the brood in your new frames in a compact cluster, as it was in the old hive, or some of it may get chilled. When you get near the central combs, you will probably lift out large clusters of bees with the comb; these are to be shaken and brushed off on the newspaper; if they do not seem disposed to crawl into the hive take hold of the edge of the paper and shake them up toward the entrance; they will soon go in.⁸³ A paper is better than a cloth, for they cannot stick fast to it. If you carefully fixed things before commencing, so there was no crack or crevice into which a bee could crawl, except into the entrance of the new hive, and if you have been careful—as you always should be—to avoid setting your (clumsy?) feet on a bee, you certainly have not killed the queen, and she is in one hive or the other. To be sure she is in the new hive, shake all before the entrance when you are done, and see that *every* bee goes into the hive. Save out the drone comb, and fix it all in a frame or frames by itself. It will do well for surplus honey, but we don't want it in the brood chamber. Utensils

and bits of comb that have much honey daubed on them may be put in the upper story for the bees to clean up, but if the weather is cool, keep the quilt down over them closely for a day or two. We would look them over carefully every day or two, and as fast as they get the combs fastened, remove the clasps or other fastenings and bend the combs into place.

Each operation is very simple and easy in itself, if you go about it at the proper time and in the right way. Bear in mind that the bees, from first to last, are to be kept constantly in subjection, by use of the smoke, and that you must never let them get the faintest idea that, by any possibility, can *they* become master. Send them back among the combs as often as they poke their heads out, until they are perfectly subdued, and hang in quiet clusters, like bees at swarming time.

It makes no difference which side up the brood combs are, in transferring; turn them horizontally from their original position, or completely upside down, as you find most convenient. Store comb in which the cells are built at an angle, would perhaps better be as it stood originally; but if you do not get it so, it makes very little difference; the bees have a way of fixing all such matters very quickly.

WHEN TO TRANSFER.

Several inquire if we would advise them to transfer bees in the months of June, July, Aug., etc. We really do not see how we can answer such a question, not knowing the persons. Among our neighbors, there are those who would work so carefully that they would be almost sure to succeed; and again, there are others who would be almost sure to fail. We are inclined to think those who make these inquiries would be quite apt to fail, for the careful ones would go to work without asking any questions, and do it at *any* season, if they were sufficiently anxious to have it done. Bees *can* be transferred at any month in the year. If in June or July, you will need an extractor to throw out the honey from the heaviest pieces, before fastening them into frames. The spring has been decided to be the best time, because there are then less bees and less honey, as a general thing, than at other times. The bees will fix up the comb better, when honey enough is being gathered to induce them to build comb to some extent, and the period of fruit blossoming seems to secure all of the above advantages more fully than any other season.

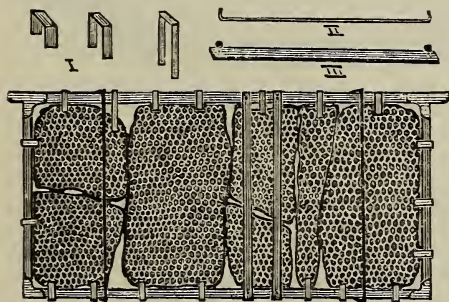
APPLIANCES FOR FASTENING IN THE COMB.

We generally use and rather prefer transferring clasps.

These are made of pieces of tin of various sizes, from $2\frac{1}{2}$ to 5 in. in length, and from $\frac{1}{4}$ to $\frac{3}{8}$ in. in width. They are bent twice, at right angles, so as to leave just $\frac{1}{4}$ of an inch between the two bends. As I have directed all our frame stuff to be made of $\frac{3}{4}$ inch lumber, these clasps will just slip over either the top, bottom, or sides, and catch on the comb, so as to hold it in place as shown in the cut below.

Thin slips of wood something like comb guides, are sometimes used by tacking them to the bars of the frame. Others wind fine binding wire clear around the frames. Some of the large bee-keepers of York State use a long, sharp thorn, which is pushed through an awl-hole made in the centre of the frame stuff. This holds the frame very securely, and the thorns may remain in, to give strength to the comb.

There is still another plan, by the use of bent wires, which I shall call transferring wires. The wires and the manner of putting them on are shown in the cut below.



TRANSFERRING CLASPS, WIRES, AND STICKS, AND THE MANNER OF USING THEM.

These wires have one advantage over the clasps, from the fact that they can be removed without lifting the frames from the hive. Just slip off the top and twist the wire half around, and it can be drawn right up. They also possess another very decided advantage. When very heavy combs are transferred, they, as a matter of course, rest with their full weight on the bottom bar, and it is sure to be bent by the weight, unless made considerably heavier, than would be needed for combs that are built down from the top bar, or for those built on fdn. Well, these wires support the lightest bottom bar until the comb is all firmly waxed into the frames, and depending from the top bar like a comb built on it naturally.

It is a very bad feature indeed, to have combs with bottom bars that have sagged, for they are constantly in danger of killing bees by striking the bottom of the hive, or the frames below, when used in a two story hive. To prevent combs being built between the upper and lower story frames, it is desirable to have remaining not more than $\frac{1}{4}$ or $\frac{3}{8}$ of an inch space between them; but we cannot do this, unless we can be assured the bottom bars are perfectly straight and true, and on this account, I am very much inclined to give the transferring wires the preference over all other modes of fastening. While the clasps will fit frames of any dimensions, the wires must be made to fit the frames they are to be used on. When one has many colonies to transfer, it will be well to provide both clasps and wires, using at least one wire to hold up the centre of the bottom bars that have much weight to sustain.

It is now December, 1879, and, after having transferred a number of colonies into light frames braced with wires (shown on page 53), I unhesitatingly give that plan the preference. Only the diagonal wires are used, and a knife-cut, in the comb, will let the wire clear down to the base of the cells, out of sight and out of the way.

All fastenings, of whatever kind (except thorns), should be removed as soon as the bees have waxed the combs fast to the frames, which will often be by the next day, if the colony is strong and the honey is coming in fast. They should be taken away soon, because they cover the cells and brood more or less. Where the combs were large and straight, I have often cut them to fit so nicely, that the frame could be sprung over them so as to hold them securely enough without any fastenings of any kind.

HOW MUCH OF THE COMBS IN THE OLD HIVES SHALL BE SAVED.

If you choose, you can save pieces not more than an inch square; I have taken little bits of comb and filled frames with them, so as to be finally worked out into very fair combs. The way I did it was to lay the frame on a board just its size and no larger. The small bits were then put in place and pressed together moderately, until the frame was full. This was then placed horizontally, board and all, over the frames of a populous colony, over night, allowing the bees to go up and cluster over the combs. True to their nature, they at once set to work, and welded or cemented these pieces all together. When it was so it would hold, I raised board

and all perpendicularly, and slipped off the board, and hung the frame in an upper story, when honey was being gathered. An assistant was so sure that these combs could never be nice ones, that I marked them with a pencil; a few days after, when the cells had all been drawn out evenly, and filled with honey, I was very loth myself to admit that the thick, beautiful comb I held up, was the mass of odds and ends of all colors which I had thus patched up. On holding it up to the light, the old ground work could plainly be seen. While such combs answer excellently for extracting, as does any kind of drone or store combs, they are not profitable for the brood chamber. In fact, it is doubtful if any natural combs are as profitable for the brood apartment, as those built on our latest improved fdn.⁸⁴ On this account, we seldom, nowadays, save any combs in transferring, except those containing brood, or the very nicest and straightest worker comb. The rest, after having the honey fed out, is condemned to the wax extractor. I think the readiest way of getting this honey out is to transfer the combs and feed it out, placing it near enough the outside of the hive, to avoid having the queen use it. It may also be placed at the other side of the division board.

If you have many weak colonies in your apiary, you may transfer a colony, and divide the combs and bees around among those needing it. In this way, you can have the combs all fixed and disposed of very quickly.

One who is expert in the business, should transfer a colony in an hour, on an average; I have taken a heavy one from a box hive, and had it completely finished in 40 minutes. Where the apiarist goes away from home to do such work, the usual price is \$1.00 for a single colony, and less for more than one, according to the number.

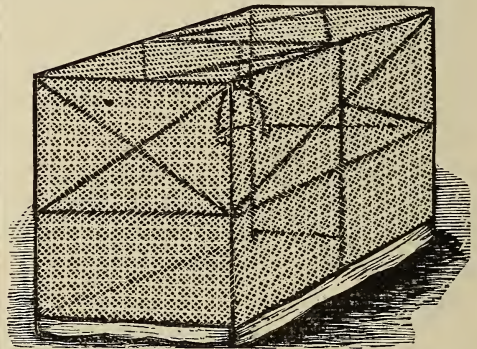
Some bee-keepers drum out the bees before transferring. The drumming is done by placing a box or hive over the old one, and drumming on the sides of the latter, until the greater part of the bees are up in the box and can be lifted off.⁸⁵ After having practiced both ways, I can but think the drumming a waste of time, and a needless annoyance to the bees. If you work properly, the bees should keep bringing in pollen and honey during the whole time, and if you place their brood combs in the same relative position to each other, they need scarcely know that their outer shell has been exchanged for a different one. Should the

bees seem troubled by the different appearance of their new home, the front board to the old hive may be leaned up over the entrance for a few days.

Many inexperienced persons have reported having succeeded perfectly in transferring, by the above directions, which have been in print now for the last five years.

TRANSFERRING WHEN THE BEES ARE DISPOSED TO ROB.

I have recommended the period between fruit-bloom, because at such a time the bees usually get honey enough to prevent robbing. Should it be necessary, however, to do it a little later, say between fruit-bloom and clover, use a mosquito-bar tent, like the one on page 206, or the one figured below.



FRAME COVERED WITH MOSQUITO BAR, TO SET OVER A HIVE WHEN ROBBERS ARE TROUBLESOME.

The whole structure, finished complete, weighs only 18 lbs. It is 5 feet high, 3 feet wide, and 5 feet long. The upright pieces are $1\frac{1}{2} \times \frac{3}{4}$; the others, $\frac{3}{4} \times \frac{3}{4}$. The boys have two of them now, and they are just jubilant over them. The whole structure can be afforded for \$1.50 set up, or \$1.25 tied up in a bundle, mosquito bar and all. When you have combs or the stool in your hands, you can carry the "tent," as they call it, by putting your head under the top-bar, and walking right along to the next hive.

TRANSFERRING IN DOORS.

If the weather is bad or the bees at all disposed to rob, you can, if you choose, carry the hive and all into some convenient out building, or into your honey house, to do the transferring. If you can work before a door with a window in it, all the better; but if no such door is at hand, do the work before a window. When you are through, place the new hive with its combs on the old stand, take out the window, and shake the bees onto the newspaper before the entrance and they will all go in.

If your new hive is placed directly under

the window while you are transferring, a great many of the bees will collect on the transferred combs, keeping the brood warm, and being just where you want them when the hive is carried to its stand. We have a glass door in the honey house, on purpose for such operations. When bees are brought in for any purpose, the restless and uneasy ones soon collect on the glass, and by swinging the door open, they quickly take wing, without much danger of admitting robbers. My neighbor, Shaw, has a window on pivots, which allow it to be swung the other side out, by simply touching a spring. This throws the bees on the outside instead of the inside of the glass, where they can take wing at their leisure. I have often thought such an arrangement would be very convenient for windows in a house apiary.

Now do not take them into a room filled with all kinds of dust, rubbish, and cobwebs, for they will get all over the room, and get lost, and you will have all sorts of trouble. There should be only one window in the room, and every thing near it should be removed; the floor should be clean, and no place left for them to crawl into and get lost, just as I told you about the out door transferring.

A SHORT WAY OF TRANSFERRING FROM BOX HIVES.

A little before swarming time, pry the top from your box hive, and set a single story Simplicity over it, making all the joints bee tight. Now hang frames filled with fdn. in this new hive, and the bees will soon work up into it. After the queen gets to laying in these combs the bees will soon all move up into it and you can lift it off, and transfer, or do what you please with the old hive and combs. When you are hurried, this plan gets your stock gradually into improved hives, without very much trouble, and no mussing with dripping honey.

TURNIP. The turnip, mustard, cabbage, rape, etc., are all members of one family, and, if I am correct, all bear honey, when circumstances are favorable. The great enemy of most of these in our locality (*especially* of the rape), is the little black cabbage flea. The turnip escapes this pest, by being sown in the fall, and were it not that it comes in bloom at almost the same time when the fruit trees do, I should consider it

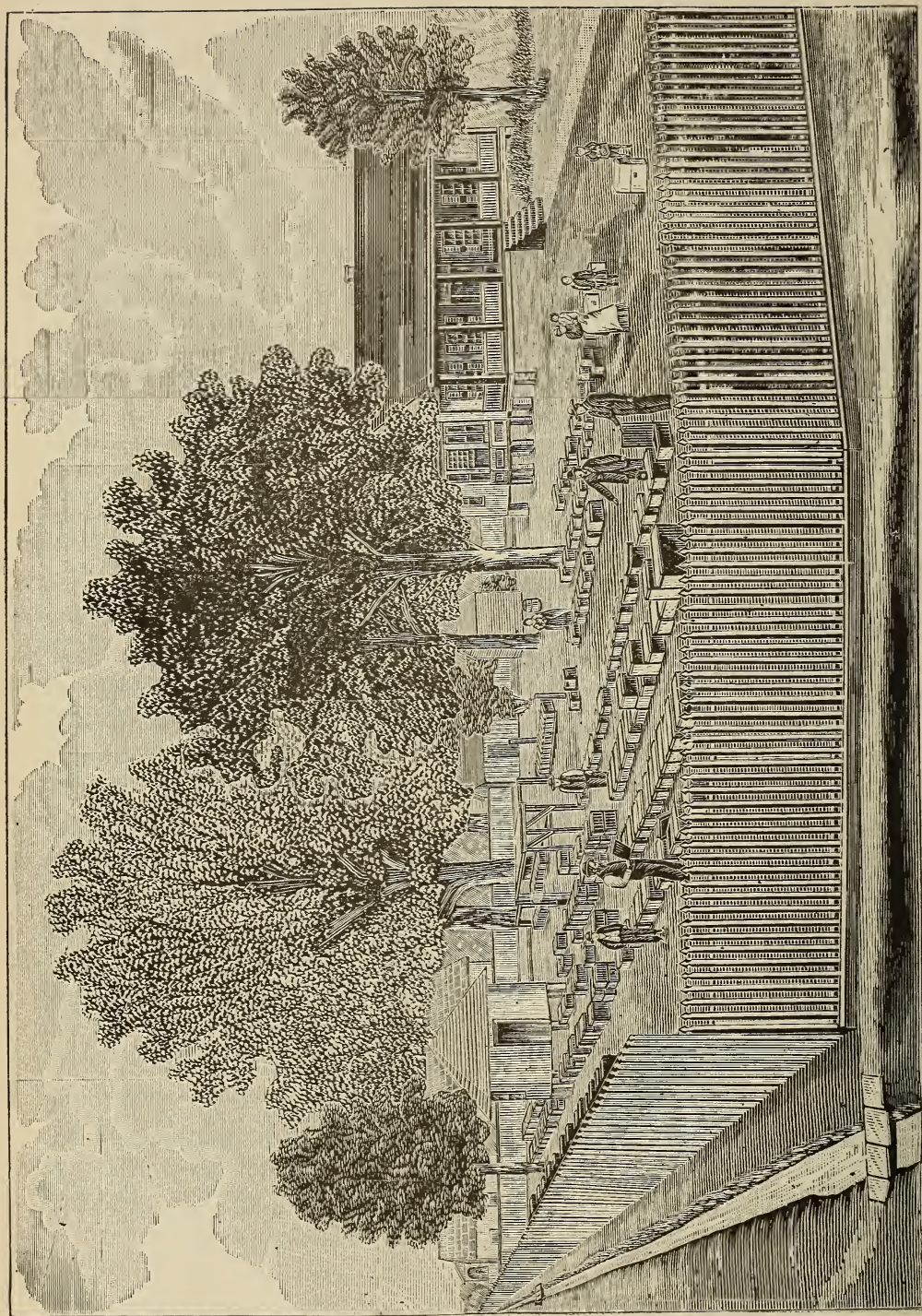
one of the most promising honey plants.

In the summer of 1877, Mr. A. W. Kaye, of Pewee Valley, Ky., sent me some seed of what is called the "Seven-Top Turnip," saying that his bees had gathered more pollen from it, in the spring, than from anything else. I sowed the seed about the 1st of Oct., on ground where early potatoes had been harvested. In Dec., they showed a luxuriance of beautiful green foliage, and in May, following, a sea of yellow blossoms, making the prettiest "posy bed," I believe, that I ever saw in my life, and the music of the bees humming among the branches was just "entrancing," to one who has an ear for such music. I never saw so many bees on any patch of blossoms of its size in my life, as could be seen on them from daylight until dark.

Friend K. recommended the plant particularly for pollen, but, besides this, I am inclined to think it will give more honey to the acre than anything that has heretofore come under my notice. We have much trouble here in raising rape and mustard, with the small turnip beetle or flea, but this turnip patch has never been touched; whether it is on account of sowing so late in the fall or because the flea does not fancy it, I am unable to say. The plants seem very hardy, and the foliage is most luxuriant, much more so than either the rape or Chinese mustard, which latter plant it much resembles, only having larger blossoms. As our patch was sown after the first of Oct., and the crop could easily be cleared from our land by the middle of June, a crop of honey could be secured without interfering with the use of the land for other purposes.

Friend K. also recommends the foliage for "greens," and says that he sows it in his garden for spring and winter use. We tried a mess of greens from our patch, in Dec., and found them excellent. Our seed was sown very thickly, in drills about one foot apart. *This* turnip bears only *tops*, and has no enlargement of the root.

If I could get a ten-acre lot covered with such bloom during the month of August, I should not hesitate an instant to hand over the money for the necessary expenses. If we cannot get the blossoms in August, we can certainly have an abundant supply between fruit bloom and clover.



P. L. VIALON'S APIARY, BAYOU GOULA, LA.

U.

UNITING BEES. Uniting colonies is much like introducing queens, inasmuch as no fixed rule can be given for all cases. It is a very simple matter to lift the frames, bees and all, out of one hive and set them into another, where the two are situated side by side. Usually, there will be no quarreling, if this is done when the weather is too cold for the bees to fly, but this is not always the case.⁸⁶ If one colony is placed close to one side of the hive, and the other to the other side, and they are small enough for a vacant comb or two between them, they will very rarely fight. After two or three days, the bees will be found to have united themselves peaceably, and the brood and stores may then be placed compactly together, and your chaff cushions put in at each side. If there are frames containing some honey, that cannot be put in, they should be placed in an upper story, and the bees allowed to carry it down. You should always look to them 20 minutes or half an hour after they are put into one hive, to see if everything is amicable on "both sides of the house." If you find any bees fighting, or any doubled up on the bottom board, give them such a smoking that they cannot tell "which from t'other," and after 15 or 20 minutes, if they are fighting again, give them another "dose," and repeat until they are good to each other. I have never failed in getting them peaceable after two or three smokings.

If you wish to unite two colonies so large that a single story will not easily contain them, which, by the way, I feel sure is always poor policy, or if their honey is scattered through the whole ten combs in each hive, proceed as before, only set one hive over the other. If this is done on a cool day, and the bees are kept in for two or three days, few, if any, will go back to the old stand. If the hives stood within 6 feet of each other, they will all get back without any trouble anyway, for they will hear the call of their comrades who have discovered

the new order of things. Sometimes you can take two colonies while flying, and put them together without trouble, by making the lost bees call their comrades. Only actual practice and acquaintance with the habits of bees will enable you to do this, and if you have not that knowledge, you must get it by experience. Get a couple of colonies that you do not value much, and practice on them. As I have said all along, beware of robbers, or you will speedily make two colonies into none at all, instead of into one.

WHAT TO DO WITH THE QUEENS.

If one of the colonies to be united has been several days queenless, all the better; for a queenless colony will often give up its locality and accept a new one, by simply shaking them in front of a hive containing a laying queen. From a hive containing neither queen nor brood, I have induced the whole lot to desert, and go over to a neighboring colony, by simply shaking the bees in front of it. They were so overjoyed at finding a laying queen, that they called all their comrades to the new home, and all hands set to work and carried every drop of honey to the hive with the fertile queen. By taking advantage of this disposition we can often make short work of uniting. If you are in a hurry, or do not care for the queens, you can unite without paying any attention to them, and one will be killed; but, as even a hybrid queen is now worth 50c., I do not think it pays to kill them. Remove the poorest one and keep her safely caged, until you are sure the other is well received by the bees. If she is killed, as is sometimes the case, you have the other to replace her.⁸⁷ Where stocks are several rods apart, they are often moved a couple of feet a day while the bees are flying briskly, until they are side by side, and then united as we have directed. This is so much trouble, that I much prefer waiting for cold weather. If your bees are in box hives, I should say your first job on hand is to transfer them. If

you have several kinds of hives in your apiary, you are about as badly off, and the remedy is to throw away all but one. My friends, those of you who are buying every patent hive that comes along, and putting your bees into them, you little know how much trouble and bother you are making yourselves for the years to come.

In conclusion, I would advise deferring the uniting of your bees until we have several cold rainy days, in Oct., for instance, on which bees will not fly.⁸⁸ Then proceed as directed. If you have followed the advice I have given, you will have little uniting to do, except with the queen rearing nuclei; and with these, you have only to take the hives away, and set the frames in the hive below, when you are done with them. If the hive below is a strong one, as it should of course be, just set the frames from the nucleus into the upper story, until all the brood has hatched. If you wish to make a colony of the various nuclei, collect them during a cold day, and put them all into one hive. If you have bees from 3 or 4, they will unite better than if they came from only two hives, and you will seldom see a bee go back to his old home. A beginner should beware of having many weak colonies in the fall, to be united. It is much safer, to have them all strong and ready for winter, long before winter comes.

UNITING NEW SWARMS.

This is so easily done, that I hardly need give directions; in fact, if two swarms come out at the same time, they are almost sure to unite, and I do not know that I ever heard of two such swarms quarreling. One of the queens will very soon be killed, but you may easily find the extra one, by looking for the ball of bees that will be found clinging about her, very soon after the bees have been joined together. A swarm can almost always be given without trouble, to any swarm that has come out the day previous, and if you will take the trouble to watch them a little, you may unite any swarm with any other new swarm, even if it came out a week or more before. Smoke them when inclined to fight, as I told you before, and make them be good to the new comers.

UNITING BEES IN THE SPRING.

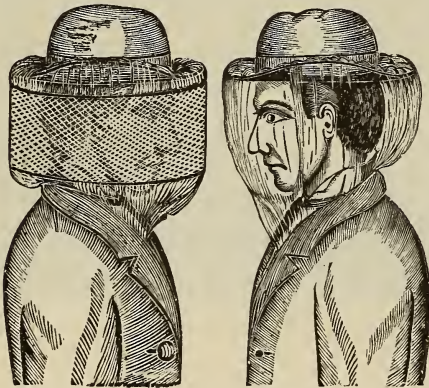
Since our spring dwindling troubles, it has been quite customary to unite a stock that has become queenless to one having a queen, or to unite two or more weak stocks, to enable them to go through the spring months. The process is much like uniting in the fall. Lift out the frames and put them together, watching to see that they are friendly to the new comers. Bees are often united in the spring for the purpose of securing great results in honey, and by uniting the bees and brood, great amounts may be obtained from what might be called a single swarm.



HEXAGONAL LAWN HIVE APIARY, OF NINETEEN HIVES, BELONGING N. H. ALLEN,
KIRKWOOD, MO.

V.

VEILS. The use of a veil over the face will often give a beginner a sense of security that will enable him to work to much better advantage than he would, if continually in fear of every bee that chanced to buzz near him. I well remember the long breath of relief which I drew, when first safely ensconced in the wire cloth fixture that Langstroth describes and recommends in his book. It was so ponderous and unwieldy, that a friend who had come to see my bees, named it the "bird cage" when he volunteered to help me introduce my first Italian queen, if I would furnish him with one like my own, to put over his head. After a little practice and experience, and a more thorough acquaintance with bees, veils of all kinds are almost always laid aside; still, as beginners invariably want them, it may be well to give the matter some consideration.



WIRE CLOTH AND LACE BEE VEILS.

There are two great objections to the use of veils; one is that they necessarily obstruct the vision more or less, and the other is that they obstruct the free circulation of air, which is so desirable in hot weather, and thus tend to make the wearer sweaty, uncomfortable, and perhaps nervous and irritable. I need hardly say that one who handles bees needs to keep "cool," in more senses than one, and he also wants the free and unobstructed use of all his faculties. Many

years ago, I advised, instead of the wire cloth bee hat, a veil made of black tarlatan, with a rubber cord put in the top, to be slipped over the hat, and the lower ends to be tucked inside the collar, as shown in the cut.

After a while, I found a fine kind of silk lace, called Brussels net, that obstructs the vision much less than the tarlatan does, or wire cloth either; but as this is quite expensive, we use it for only that portion of the veil that comes directly in front of the eyes, and these are the veils which we have used for the past half dozen years perhaps. As the tarlatan is not a very strong fabric, we have quite recently used in its place, black grenadine.⁸⁹ I do not myself use a veil at all, or at least very seldom, preferring the chance of an occasional sting, to having my eyesight obstructed and being hampered with any unnecessary clothing, when working in the hot sun. Within the past year, several attempts have been made to improve veils on both the points I have mentioned. The principal point where clear vision is demanded is in looking for eggs, in old, dark combs. With a veil, you might decide that your queens had not commenced laying, being unable to detect the tiny speck of an egg, at the bottom of the cells, but with the veil removed, you would be able to see the eggs at once. A piece of glass might be framed and sewed into the veil just before the eyes, but it would be in danger of being broken. To remedy this difficulty, Mr. A. Nickerson, of Norwalk, Conn., has suggested a thin sheet of mica, such as is used for stove fronts.⁹⁰ This gives a very clear vision, when it is perfectly clean, but judging from the way in which most of the A B C class manage, I should expect it very soon to get so soiled, that the wire cloth or lace would be much the clearer medium to see eggs through. The latest idea is a wire cloth with meshes just as large as they possibly can be without admitting a bee, and made of very fine hair wire. It is found by experiment that the wire, lace, or whatever else be used, should

be black, rather than any other color. I am at present taking steps to have a wire cloth of this kind made. The difficulty seems to be in having a durable wire cloth, with such fine wire, and so large a mesh. Such wire cloth, besides being cooler than any of the other fabrics used, would be much stronger, and as a veil is in constant danger of being caught and torn on shrubbery, etc., to say nothing of the probability of a rent from the frantic efforts of the young apiarist to get a bee out, which may, by chance, get imprisoned inside, they really ought to be made of something as nearly like sheet iron, in strength, as possible. It may be well to state that no danger need be apprehended from a bee who gets inside, for all his energies are at once devoted to getting out, instead of to stinging, unless, by some chance, he should get pinched. A piece of wire cloth about 2½ feet long, by 9 inches wide, will be about right for most persons; I would have some soft fabric attached to it at the top to go around the hat, and also at the bottom, to tuck inside the collar. Be sure no loose ends of wire are left sticking out to catch and tear the cloth, for the annoyance of such things when one is writhing under the infliction of a sting, does not particularly contribute to the Christian frame of mind, which a bee-keeper, above all other persons, should strive to carry constantly with him.

M. M. Baldridge, of St. Charles, Ill., gives the following in the *Prairie Farmer* of May 17, 1879.

Some use a hat made of wire cloth, but that is very bad for the eyes. I nearly ruined my eyes by its use some 20 years ago. In no case would I advise its use, for a bee veil, properly made, is much better.

Notwithstanding this, a good many still adhere to the use of wire cloth, and among them is our good friend Mrs. Harrison. We give the picture, and her directions for making, from March *Gleanings*, 1882:—

Here we are, dressed *cap-a-pie* for work in the apiary. There is one thing lacking in the picture, which we wear when bees are very cross, and we did not put it on; for if we had, you could not have seen how the cape is made. We put on a linen sack, or a gent's vest is buttoned on, and we then have a perfect head-gear, as no bees can gain access by creeping under the cape or around the arms. Our assistant will wear a long-sleeved apron, fastened around the bottom of the hat, and, if bees are very cross, wear leggins or a long skirt.

The hat is made of green wire gauze, such as screens are made of; the top of pasteboard, and bottom of calico. In making, we are careful to leave no wires to stick our hands or head when we put it on. We first roll up a hem; and if the wires stick through, hammer it upon a flatiron. When all sticking wires are disposed of, it is bound top and bottom, joined at the back, the top and cape sewed

on. At the bottom of the cape is a wide hem, through which a string is run; under one arm is left open, and the other is joined with a string, thus forming an arm-hole. We put our arm through this hole, slip on the hat, and tie it at the open side. When we are stooping over a hive, the wire cloth rests upon the back of the head; and, to prevent the bees stinging through there, a postal card is sewed on the under side. Our hands are covered with buckskin gloves, which have deming sewed on to the gauntlets, kept in place by elastic. The apron has capacious pockets, which are always handy for a screw-driver, handkerchief, etc.



BEE DRESS USED BY MRS. L. HARRISON, OF PEORIA, ILLINOIS.

We never succeeded very well with a veil. If we only wanted to walk around the apiary, it was all right; but when we worked, getting into all sorts of positions, it was sure to get close to our face or neck, and stings were the result.

Peoria, Ill., Jan., 1882.

MRS. L. HARRISON.

VENTILATION. I should be tempted to pass this subject by as one of little importance comparatively, were it to be considered only in the light in which it has been presented by the vendors of patent hives.

I do not mean that bees do not need ventilation, but that they get it, ordinarily, through the entrance, and through the cracks and crevices which, as a general thing, are found in even the best made hives, providing the hive is properly constructed in other respects considered under the head of WINTERING. I do not believe in holes made in different portions of the hive, and covered with wire cloth, because the bees persistently

wax the wire cloth over, just as soon as they get strong enough to be able to do so. If we omit the wire cloth, they will, in time, build the holes up, by much labor, with walls of propolis, until they have effectually stopped the inconvenient drafts that the improved (?) ventilators would admit at all times through the hive. During extremely hot weather, a powerful colony may need more air than is afforded by an ordinary entrance, especially, if the hive stands fully in the sun. In such a case, I would much prefer giving the bees shade, to cutting ventilation holes, which the bees will soon begin to use as entrances, and when the hot weather is over, and it is desirable to close these entrances, you confuse and annoy the bees by so doing. On this account, I would give all the ventilation that a strong colony might need to keep them inside at work in the boxes, by simply enlarging the entrance. This can be done very readily with the Simplicity hives, and I have frequently given them an entrance, under such circumstances, the whole width of the hive, and as much as two or three inches broad. The chaff hive with its entrance 8 inches by $\frac{3}{4}$, has always had all the ventilation it seemed to require, because the sun can never strike directly on the walls of the apartment containing the bees and honey. For the same reason, the house apiary with its 2 inch auger hole entrance has never required any further provision for ventilation. The chaff cushions placed over the bees in winter are kept over the surplus frames for the greater part of the time in summer, to confine the heat during cool nights, and from their porous nature, they allow of the escape of more or less air that comes in slowly through the entrance, the honey boxes having no other covering than the broad frames that hold the sections and these same chaff cushions. I have obtained more surplus honey with this arrangement, than with any other, and am firmly persuaded that a great loss of honey often results from allowing such a draft of air through the hive, that the bees cannot work the wax, unless during the extremely warm weather. To test this matter, I covered a large colony in the house apiary, with woolen blankets while they were gathering clover honey, to induce them to remain in the boxes, even after the weather had turned quite cool. So long as the blankets remained on, the bees would remain in the boxes working wax; but as soon as the blankets were removed, at each time the experiment was tried, they retreated to the body of the hive. The same thing was tried with thin walled-hives out of doors.⁹¹

SMOTHERING BEES BY CLOSING THE ENTRANCE.

Although bees will make out to get along, even with a very small entrance, we should be very careful about closing the entrance entirely, in warm weather, even for only a few minutes. Many are the reports we get almost every season, of bees destroyed by simply closing their entrance, while undertaking to stop their swarming for a few minutes, until some other colony can be attended to. See SWARMING, ENTRANCES, and ROBBERING, especially the last head, *How to Stop Robbing*.

When bees have the swarming fever, as a general thing they are gorged with honey, and in a feverish state. They are like a man who has been taking violent exercise after a hearty meal, and require more than an ordinary amount of air. Their breathing-tubes are in different parts of the body, principally under the wings, and as soon as the entrance is closed, they crowd about it, and when the heat of so many becomes suffocating, as it will in a very few minutes, the honey is involuntarily discharged, wetting themselves and their companions, and most effectually closing their breathing-tubes, in a way that causes death to ensue very quickly. I have known of heavy swarms being killed in the short space of fifteen minutes, when the hive was thus closed on them. The heat generated by the smothering mass will often be great enough to melt down the combs, enveloping bees, brood, honey, and all, in a mass almost scalding hot. Bees are sometimes smothered in this way, in extremely hot weather, even when they have very large openings covered with wire cloth. In fact, I have once or twice had bees, when shipped by R. R., in July and August, get hot and smother, when the whole top of the hive was covered with wire cloth. I took a lesson from this, and put wire cloth over both top and bottom of the hive, and then put inch strips across, so the hive could not be set down in such a way as to cover the bottom, and have had no more smothering since, while being shipped. When thus prepared, I have sent the heaviest colonies, during the hottest of summer weather, with hives full of honey, and had no trouble. See MOVING BEES.

HOW THE BEES DO THEIR OWN VENTILATING.

If you watch a colony of bees during a warm day, you will see rows of bees standing around the entrance, and clear inside of the hive, with their heads all one way, all making their wings go in a peculiar manner,

much as they do in flying; but instead of propelling their bodies along, they propel the air behind them, and a pretty strong "blow" they get up, too, as you may tell by holding your hand near them. Well, if the air is very hot and close inside the hive, so much so that there is danger of the combs melting down, they will manage so as to send cooling currents clear to the farthest parts of the hive, and even up a small hole into honey boxes, where honey boxes are made after such old fashioned patterns. This idea is not by any means new, and those who have invented patent ventilators will tell us with a very fair show of reason, how many bees are thus employed blowing through the hive, that might just as well be out in the fields gathering honey. I once thought so, and that ventilators were needed, but after watching the matter longer I concluded the harm done by excessive heat was far less than that from cold drafts when they were not needed, and that it is better to let a few of the bees waste some time in the middle of the day, than to have comb building stopped entirely at night, on account of the drafts given by these thoroughly ventilated hives. The most prosperous colony I ever owned was one that was so completely enveloped in chaff, that they sent a stream of warm air out of their hive, during frosty nights in March, strong enough to melt the frost about one side of the entrance. Of course, a stream of cold air went in at the opposite side, as fast as the warm air went out. When I can get a hive into this condition of things, they always prosper, and it is on this account, that I would have no other arrangement for ventilation, than that furnished by the entrance.

VENTILATING QUEEN CAGES DURING SHIPMENT.

This is a very simple matter, during quite warm weather, for all we have to do, is to have a broad surface of wire cloth, and they will then be sure to have enough air. When queens are to be shipped during cool weather, it is desirable to have them tucked up as warmly as may be, and still have all the air they need. Wood for cages is much better than metals, because it is a non-conductor

of heat, and also because it prevents stickiness from their food by absorbing portions that the metal would not absorb. If the bees or queens become daubed, they very quickly suffocate, for the reasons I have given above.

VINEGAR. This seems to merit a place in our book as being one of the legitimate products of honey, and, doubtless, in many localities, it may be profitably manufactured, and sold as honey vinegar; especially, since the recent low prices of extracted honey. As I have had but little practical experience in making vinegar from honey, I give you the following letters which have appeared in the back volumes of *GLEANINGS*.

"Some one inquired whether honey vinegar is good or not. I will say yes; the best there is made. It will not die or lose its strength like most other vinegars, and you can have light or dark vinegar as you take light or dark honey to make it from. You can make what is called sweet pickles with it without any fear of spoiling. Last season a neighbor's family bought honey vinegar of me to do their choice pickling with when they had cider vinegar of their own make, as it was so much better, they said, than cider. I cannot give any rule for making it, as I have made it from the washings of vessels used in extracting, and of the cappings after the honey was pretty well drained out, but there has got to be such a demand for it in our neighborhood that I will have to make some from the clear honey this year."

R. R. MURPHY.

Fulton, Ills., May 6, 1876.

I can give my testimony in favor of honey vinegar. We have used no other for two years, and nearly every one who tastes our pickles asks my wife for her receipt for making them. When told that we used nothing but honey vinegar, they are surprised, and say that they have always heard it would not keep pickles. The only trouble that we have had is, it keeps getting stronger and stronger, and we have to occasionally put in some water. As we have only used the waste honey from extracting, we cannot give the proportions of honey and water, but usually have it too sweet at first, and have to add more water. If it does not sour enough, we put it in a keg and set it in the sun with a black junk bottle in the bung. Do you think the bottle has any thing to do with the circulation of air? I have thought it might.

G. W. GATES.

Bartlett, Tenn., May 29, '76.

Another friend, H. A. Palmer, of Madora, Iowa, says, "One pound of honey will make 3 gallons of better vinegar than one can buy."⁹²

W.

WATER FOR BEES. That bees need water has been pretty well demonstrated, but the best means of supplying them has not been very satisfactorily settled. The amount of water needed depends much on whether they are rearing brood in considerable quantities or not, and whether their food is old, thick (possibly candied) honey, or new honey right from the fields. If the latter, it contains usually a large quantity of water that must be expelled before the honey can be considered ripened. See **VENTILATION**. Well, while the bees are gathering this thin, raw honey, as a matter of course, they will not need much water, if any at all, besides what the honey affords them. This new honey is frequently so thin that it runs out of the combs like sweetened water, when they are turned horizontally, and when tasted, it seems, in reality, but sweetened water. The excess of moisture is probably—I say probably, for I do not know that we have positive proof on the matter—expelled by the strong currents of air the bees keep circulating through the hive, which takes up the watery particles, and speedily reduces the honey to such a consistency that it will not sour. If you will examine a hive very early in the morning during the height of the honey season, you will find the blast of air that comes out quite heavily charged with moisture, and when the weather is a little cool, this moisture often condenses and accumulates on the alighting board, until it forms a little pool of water. Where the alighting board was of the right shape to retain the water, I have seen it so deep as to drown bees in passing out. These bees, it would seem, were at least in no need of having water supplied them. While I am on the subject, I will mention another way which, as I have discovered, the bees have of expelling the liquid portions from very thin honey. I guess I will say it is the way in which I *think* they do it, for I may be mistaken. I

had several colonies in a small greenhouse for experiment. They were fed on sweetened water, until they stored a large amount in their combs. When the sun warmed up the air in the morning, they would come out in great numbers and sport in the sunshine, and by taking a post where they came between my eye and the sun, I distinctly saw them discharge from their bodies, what seemed to be only pure water. These bees had been fed until they had their hives so full of the thin syrup, that they had even crowded out the eggs. When coming out of their hives, they seemed heavily laden, but those returning were so much reduced in size, as to make quite a contrast to those going out. By watching the matter, it seemed quite plain that they took the thin food into their stomachs, and after a time, longer or shorter, were able to expel the liquid portion while on the wing, and then return the thick portion to the cells. If I am in error in this, I should like to be corrected.⁹³ It may be well to state in this connection that honey, no matter how thin, will never sour while in the hive, under the care of a sufficient number of bees, but if a comb of this thin honey be taken away from them, and kept outside of the hive, it will sour very quickly.

As the following little sketch given in **GLEANINGS**, in July, 1874, gives a vivid idea of one way of giving bees water, and of the way they use it, I give it entire.

WATER FOR BEES.

“They are robbing the Quinby hive, now,” Mrs. N. had said to Novice who was suffering from a “tormented headache,” to use his own expression, one pleasant Sunday afternoon in May. He had often boasted *he* didn’t have headaches, and seemed, so the women folks say, to regard the matter as a kind of feminine weakness that one should be ashamed of, but now he was making more of a row about it than a whole dozen of the weaker sex; besides this, some neighboring

black bees had just discovered that a quantity of combs of nicely sealed sugar syrup were but poorly guarded by a few miserably weak Italian stocks. Under the circumstances, Mrs. N. and Master Ernest had been directed to close the entrances of such hives as failed to make a successful resistance, by banking the saw-dust up in front. They soon reported that the robbers were going out and in under the cover of the Quinby hive, it having warped enough to allow this. In this dilemma, Novice was again consulted, and was obliged to cease rolling and tumbling on the bed where he lay, long enough to direct that stove wood be piled on the cover until the cracks were closed. This was done, and Mrs. N., for additional security, placed on the centre of the top of the hive a large stone jar, inverted.

When Novice awoke next morning at about his usual hour—5 o'clock—although a little sadder than usual, and perhaps wiser, his head was free from pain, and he, of course, repaired at once to the apiary, the scene of yesterday's troubles and turmoils.

A refreshing shower, which had been much needed, had materially changed the aspect of things, and as the locust blossoms had opened during the night, all robbing had ceased and every thing was lovely.

On turning his eyes toward the Quinby hive, which stood under the shade of a dwarf pear tree, he beheld a perfect circle of bees for all the world like beads strung on a string, greedily sipping the rain water from the concave bottom of that inverted stone jar. It was raised up so they could find it readily, was clean, and so shallow it could not drown them, and altogether seemed just the thing. Later, after Blue Eyes was up, the numbers had increased, and so intent were they on sipping the pure water, that she could touch them with her fingers without their scarcely noticing the interruption. Of course the supply was soon out, or would have been had we not replenished it; the concavity held about a tea-cupfull, and Miss Maudie was commissioned to see that they did not "get out." But they did for all that; for during hot days, several tea-cupfulls were needed, partly on account of evaporation, and it only remained for Novice to devise a cheap and simple mechanical arrangement to keep constantly full the shallow cavity in the bottom of that stone jar. This he did very quickly by filling a quart glass fruit jar with water; a piece of paper was laid over the mouth until it could be inverted on the stone jar, and then the paper was

drawn out. Of course when the water became exhausted so as to allow a bubble of air to go up into the jar, a little more water came down, and so on. A quart of water lasts several days, and the receptacle being glass, we can always see when it needs replenishing. We were amused this morning to see the usual number of bees around it, and more going and coming quickly, even though it was *raining* quite briskly. Many of the bees were quite young Italians that, it seems, had become so accustomed to going to a certain spot for water, that they couldn't think of doing otherwise even though water was raining down all about them. We are well aware the principle of the above is not new, as feeders on a similar plan are in use, but the plan of supplying fresh water is new, at least to us. We have in former years tried arrangements with shavings, water allowed to drip on a board, and a cloth laid over a vessel full of water, but all of them were soon abandoned because they were too much trouble, or were untidy, etc., and the bees were allowed to go to distant muddy streams, to the pump, etc. Is it not a fact that during the working season the workers mostly fail from worn out wings? and, if this is the case, should we not save them all we can by having supplies near at hand? at least water, if we can do nothing further?

Our 4000 basswood trees were planted with this end in view; that is, to give them as much forage within one fourth mile of their hives, as they usually get in an area of one and a half or two miles around their hives.

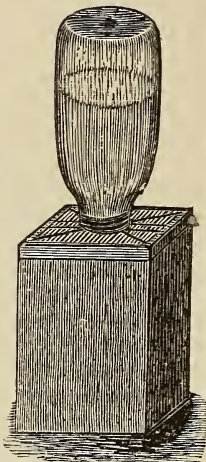
The device we have mentioned can of course be used for out door feeding, and it is perfectly secure from waste; by inverting a tumbler of syrup in a saucer, we can also use it for feeding in the hives, when there is no occasion to feed rapidly. This latter plan has been given several times in print already.

If the bees that frequent your water jar come in large numbers, it may not flow from the jar fast enough, unless the mouth is raised slightly; this we do by means of a few bits of window glass.

IMPROVEMENT ON THE ABOVE.

The above was written just about four years ago, this present month. I have just been improving on it a little, and below, submit the arrangement as we have it in the apiary now, for watering bees. Get a piece of board about 1 foot square, and with a saw, or saws, such as we use for grooving

the ends of the pieces composing the section boxes, plough grooves from one end of the board to the other, being careful that they do not run quite out. Now, with a single saw, cut a groove from each corner to the opposite one, and a couple more across the grain of the wood, near the middle, and the board is done. These grooves should be about $\frac{1}{4}$ inch deep, and about the same distance from each other. Invert the jar of water on the center of the board, and the grooves will keep just full of water, as long as any remains in the jar, and yet they will never run over. The bees can stand on the walls of wood that separate the grooves, as well as on a sheet of their own comb, and with as little danger of getting daubed, or wetted. Now this arrangement makes per-



WATERING JAR
AND BOARD, OR
OPEN AIR
FEEDER.

haps the best feeder ever invented, for open air feeding (see FEEDING AND FEEDERS); for all we have to do is to use sweetened water, instead of water only. Put a pound of coffee sugar in the jar, fill up with water, cover it with your hand, and shake briskly, and it is ready for business. Lay a paper over the mouth of the jar, as before, invert it on the centre of the board where the grooves cross, draw out the paper, and, if it is at a time when robber bees are hovering about, some one will soon find it. After the first bee has gone home with one load, he will bring others back with him, and pretty soon, the board will be covered with them, sipping like a lot of pigs out of a trough. As the syrup goes down in the grooves, air will be allowed to come in, and you can see, by the bubbles rising in the jar, just how fast they are taking the syrup.

I have just been watching one of these feeders (May 31, 1879), and after the bees got well at work, a bubble would be on its way to the surface in the jar, almost constantly, and the liquid was carried off by the little fellows, at the rate of about 1 inch in 10 minutes. This would empty the $\frac{1}{2}$ gallon jar in about an hour and a half. Not a bee is daubed, and they flit away to their hives, as easily as if they had loaded up from the blossoms on the trees. This feed-

er answers admirably for feeding grape sugar, for all we have to do is to fill the jar with lumps of it, and pour in water until it is filled, and then invert as described. The passage of the bubbles upward tends to dissolve the sugar rapidly. Old, thick, or candied honey may be fed in the same way, and when the bees stop, the feed stops coming down into the grooves. This will perhaps be the best arrangement we can have for feeding grape sugar to keep brood rearing going on, during a season of drouth or scarcity.

In the above engraving, the jar and board are represented as standing on a block of stone, but they may be placed on a box or block of wood as well. We keep the device a few rods from the apiary, under a clump of trees, to call away the robbers from about the hives. Of course, the arrangement may be placed inside the hives, by putting in a division board, or setting it in an upper story.

If you wish to give them a supply that will last them a month or more, it may be well to get a large glass bottle or carboy, at the drug store, and your bees will then have water during the season, all they can use. Where there is a spring near you that can be conducted to the apiary, a very pretty watering place can be made. Be sure that it is so arranged that the bees cannot get drowned. A little fountain, where the spring is high enough to allow it, is a very pretty addition to the apiary. I once had one made with an iron vase, perhaps eighteen inches across. This basin was always full, and overflowing slightly, and during the warm weather all summer long, bees would be sipping the water around the edge; sometimes they stood side by side clear around the edge of the vase, making a sight that was enough to call forth exclamations of surprise from almost any body, bee keeper or not. The fountain was supplied with water from a large pine box, placed on the roof of the wood house and itself supplied by the eave spout from the upright part of the building. When the box was full, it ran over on the roof and down into the cistern as usual, so the arrangement required no special supervision, so long as we had rain as often as once a week. The connection between the box and the fountain near the apiary was by $\frac{1}{2}$ inch iron pipe. The bees never drowned in this fountain because the vase was always full and overflowing. If a bee flew in, or got pushed in by his companions, he soon buzzed over to the side and

walked out, having no perpendicular sides to climb up. Below I give you an engraving of the vase and fountain.



FOUNTAIN FOR GIVING BEES ACCESS TO WATER.

You will observe a stop-cock at the lower part of the jet. This is for the purpose of regulating the supply of water. During a dry time, it is to be turned so as to just keep the vase full, and the same during windy days, when the water would be blown away. When we had still evenings, the jet was opened so as to throw a stream perhaps six feet high. Around the fountain we had flowers of different kinds. It is hard to imagine a prettier adjunct to an apiary than a watering fountain surrounded with flowers humming with busy laborers.

During some experiments in the same greenhouse I have mentioned, I put a small colony into the lamp nursery, and warmed it up until their hive indicated over 100 degrees. The bees then went out, and began flying around the room as if in quest of something. I fixed the same watering jar I have mentioned in one corner of the room, and they pretty soon found it and were busy carrying water into the hive as fast as they could load up and unload. By turning the lamp up or down so as to increase or diminish the temperature, I could easily make them stop and commence carrying water, at pleasure. Does not this seem to indicate that hives should be shaded, during the extreme heat of the summer weather? Colonies in the same room whose hives were not warmed showed no disposition to gather water at all, although they were rearing brood in considerable quantities.

SALT WATER FOR BEES.

At times, bees unquestionably show a

fondness for salt water, and I presume they should have access to salt in some way, as well as others of the animal kingdom. It is generally agreed, I believe, that cattle, horses, sheep, etc., must have salt, or they will suffer. I know of no reason why bees should not come under the same law. They seem to have a preference for it in a much diluted form, and are very often seen eagerly hovering over barrels containing refuse brine. I have seen them eagerly digging in the sawdust, where brine had been spilled or thrown out, showing their craving for it. Within the past year, 1879, a great many plans have been given for feeding bees salt, but none of them are any simpler or easier, than the one for giving them water, which I have already illustrated. It may be well to have two watering places, one with the water slightly salted, and the other of pure water; you can then easily tell which your bees prefer.

If no place is furnished for the bees to get water, they usually go to creeks or puddles near by. Our own have quite a fashion of congregating about the kitchen pump, and Mrs. R. says she knows they hear the pump, for just after water has been drawn, they come in considerable numbers and sip the water that is spilled on the stones. Some of our subscribers have complained that they could not keep their bees from going to their neighbor's pumps, and thus annoying them. I think you will have no difficulty if you provide an arrangement such as I have described, and keep water in it during the whole warm season. It may take them some little time to get used to going to the precise spot, but after it is once learned, they will never forget it. Look out for the comfort and convenience of these little friends of ours, and they will, in time, contribute to our comfort and convenience.

WAX. Whether bees make honey or simply collect it, may be a subject of discussion, but we believe there is no question in regard to wax, for bees do assuredly make it. If you have your doubts, however, just watch them closely during the height of the honey harvest, or what is perhaps better, feed a colony heavily on sugar syrup for about 3 days during warm weather. At the end of the second or third day, by looking closely, you will see little pearly disks of wax, somewhat resembling fish scales, protruding from between the rings on the under side of the body of the bee, and, if you examine with a microscope, you will find these little wax cakes of rare beauty. Sometimes, es

pecially when the bees are being fed heavily, these wax scales will fall down on the bottom board and may be scraped up in considerable quantities, seeming for some reason to have been unwanted. During the seasons of the natural secretion of the wax, if the colony has a hive affording plenty of room for surplus, we believe these wax scales are seldom wasted. At the swarming time, there seems to be an unusual number of bees provided with these wax scales; for, if they have remained clustered on a limb for only a few minutes, bits of wax are found attached, as if they were going to start comb. When they are domiciled in their new hive, comes the time, if the hive pleases them, for them to show their astonishing skill and dexterity in fabricating the honey comb.

In the attempts that have been made to supply material for artificial comb, we have had a view of the wondrous skill with which nature supplies just what is needed for the safety and well being of her creatures. Many substances seem, at first view, to have all the requirements needed, but when we discover that the material must be sufficiently soft to be readily molded at the ordinary temperature of the hive, and yet be in no danger of melting down during the intense heat of midsummer, we see that perhaps no other material than just the wax they secrete can come anywhere near answering the purpose. Wax melts at about 145° in its natural yellow state, but becomes so soft that it may be molded by pressure at a temperature of about 100° or less. When this yellow wax is exposed to the sun and moisture in the shape of thin ribbons, it gradually loses its yellow color, and becomes white. Its melting point is also raised by this change about 12°, yet it is still readily worked into comb if given to the bees during hot weather, and when raised up into cells, it has a most beautiful appearance of snowy whiteness. This, however, is soon soiled and colored, if left in the hive, for neat as bees are said to be, they have a habit of running over the clean white combs with muddy or at least dirty feet. With old and dark combs this might be unnoticed, but in a hive furnished with combs made from bleached foundations, it becomes very apparent.

Like other folks, the bees seem more careful of their best rooms, for the surplus honey boxes are kept much cleaner than the ordinary working room, or brood apartment, though this may not be intentional after all, for it is principally the young bees that have never been out in the fields, that work at

comb-building and in the boxes. On this account, clean, yellow wax, when used for foundations, will give very nearly as fine box honey when filled and capped over, as does the bleached. As the latter is considerably harder than the yellow, it is not worked into comb as rapidly. When the bees are needing room they will frequently raise a whole sheet of yellow foundation into very fair comb in a single night, while it would require nearly double the time perhaps to do the same with the bleached.

Until somebody shall discover a use for propolis, we shall have to consider the products of the apiary but two in number, wax and honey. It is true, bees and queens are now quite marketable commodities, but as they are bought only for the wax and honey they may produce, they can hardly be considered as legitimate apian products.

The manner of getting the honey into a marketable shape has been very fully discussed, and great improvement has been made, in this particular, within the past few years; but the operation of rendering the combs into clean, nice wax, so as to be attractive to the eye of purchasers, has been very little improved since the time when our grandmothers used to boil them in a large kettle, and squeeze the wax from the melted mass through a cloth or bag, much in the way lard is expressed. Our engraving given shows the only implement offered for sale at present. It is called the Swiss wax extractor; and, if I am correct, was introduced into our country about the year 1869, by Mr. A. Gray, of Reily, O. The following report in regard to it, furnished by Adam Grimm, of Jefferson, Wis., I extract from the *American Bee Journal*, of April, 1871.

WAX EXTRACTOR.

It is only a few years since we got the mel extractor, and we have by its aid succeeded in doubling and even trebling our yield of honey. And now, again, our brethren across the ocean have sent us an apparatus that is of great value to the bee-keeper. It is what I venture to name the wax extractor, an apparatus devised by Prof. Gerster, of Berne, in Switzerland, for the purpose of extracting wax from the combs. While all bee-keepers agree, that all nice, not too old, comb should be saved, it will also be conceded that in an apiary of some size and age, an amount of comb will continually accumulate that is only good for rendering into wax. A bee-keeper whose main object in keeping bees is profit will therefore need an apparatus for rendering this wax, whenever he gets a supply of combs no longer serviceable in the hives; and it becomes of great importance that the wax should be extracted before the moths get hold of it, store it with eggs, and a horde of troublesome and destructive millers are bred for future annoyance.

An apparatus should be had, too, by which all the wax that can possibly be got out of very old combs can be secured; of a quality that will command the highest market price.

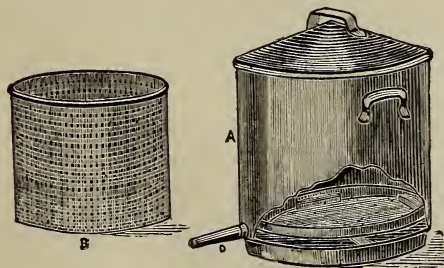
Such an apparatus we get in the one exhibited at the Indianapolis Convention by my friend, A. Gray, and which was handed over to me to be tested. My wife, who usually has to do a large share of the work connected with the straining of wax, and has often complained, in former days, of having her kitchen floor, stove, kettles, and pans bedaubed with wax, is delighted with this new invention. She can now with ease strain all the wax, without the aid of any other person, and without being hindered thereby in her other work. In cold weather, she says, she will not need an extra stick of wood; but the greatest point of superiority is the utter impossibility of the contents of the vessel boiling over, a feature alone important enough to assure the adoption of this mode of rendering wax. How often in former days, from momentary inattention, did we find the boiling liquid flowing over the stove and down to the floor, a misadventure to which we are not here exposed.

The wax extracted by this apparatus is of the brightest yellow color I have ever seen, even when it is extracted from very old dark combs. It is free from all resinous matter, and will doubtless bring the highest price in the market. I am satisfied, too, that the refuse is as clear of wax as we ever get it by any other process, if tried till it stops running. There is but one drawback connected with it. The women say they do not get through with the extracting as speedily as when we used the cider press, by means of which three men could render 100 lbs. per day. When very old combs are to be rendered, not over 20 lbs. can be extracted in one day. But as the time when bees were brimstoned and all their combs rendered into wax is now nearly over, and the chances for getting large quantities of wax are thus gone or going by, I cheerfully recommend the wax extractor exhibited at the Indianapolis Convention by Mr. Gray, as the next best thing to the mel extractor.

A. GRIMM.

Jefferson, Wis.

Friend Grimm has given pretty faithfully, in his article, the good and bad points of the machine.



THE GERSTER WAX EXTRACTOR.

The basket, B, is made of perforated tin, and it is into this that the pieces of comb, cappings, etc., are to be put, and allowed to drain into a pan or some convenient vessel. It is true, you can put them into the extractor, honey and all, and the spout, D, will deliver both wax and honey into the

pan or other vessel set to catch it, and when the wax is cold, it may be lifted from the honey below, in a solid cake; but the honey is then dark, and only fit for vinegar, or for feeding bees. Whereas, if drained before being subjected to heat, we get the very best and nicest liquid honey, especially, if it is cappings that are to be rendered; because the honey that adheres to the cappings, is always that which has been sealed up. When the basket, B, is filled with drained cappings, or bits of comb, the cover of A is to be removed, and the basket placed inside, resting on the fixed, shallow pan, shown where the side is cut away. This pan has three pieces fixed near its inside rim (only two of which are visible), to support the basket a little distance from the bottom, and the spout, D, is put into this shallow dish, so as to take all the wax as it falls from the perforated basket above. Now to set the machine working, we have only to supply steam around the basket. We do this, by setting it over a pan or kettle of boiling water, or what is better, a copper bottomed steam generator, often sold with the apparatus. The latter utensil will do very well to catch the drippings of the honey, if a cork is fitted tightly in the tube, D. I would advise you to keep the cover on and this tube corked at all times, if you do not wish robber bees to learn that the machine is almost always a nice place for their depredations. If you do this, you can keep it in the apiary, and throw every bit of comb into it, as soon as found.

If you will go back to Grimm's description, you will see that he calls the machine slow, and says that his wife could not well get out more than 20 lbs. a day. I think I should put it at 50 lbs. or even more, but it is not as rapid as the cider press he speaks of. Mr. W. W. Cary, of Colerain, Mass., sends us the following description of a plan similar to the cider press, which, I think, might prove of much value, if a large quantity of wax is to be got out, as is often the case where many stocks are to be transferred.

Mr. A. I. Root:—Below you will find a description of Cary's wax press. I call it Cary's, because I have never seen or heard of any thing like it. The idea suggested itself to me, from the way in which I press my cider, in burlap and racks, just as in the wax press.

CARY'S WAX PRESS.

Make a boiler of good heavy tin, 18 in. square, by 13 in. high, inside measure. Solder stout handles on two of the sides, and put a spout on one of the other sides, about 4 inches from the top. The spout consists of a tunnel, 3 in. in diameter at the top and 1 in.

at the small end, and about 3 in. long, flattened at the large end so as to make it oval shaped. This is for running off the wax, and the mouth of it should be 3 or 4 in. wide by 1 high on the inside of the boiler. Now cut out a hole on one side of the boiler and solder on the spout, which will need a brace to hold it steady. Perhaps one of your molasses gates for extractors would be a good thing soldered to this spout; we use a cork however.

Now make 6 racks of pine strips, $\frac{1}{2}$ inch wide, by $\frac{3}{4}$ thick. The slats should be planed on all sides. Cut them $17\frac{1}{2}$ in. long, and take 2 strips $\frac{3}{4}$ thick by 1 in. wide and $17\frac{1}{2}$ in. long, and nail the other strips on crosswise, leaving $\frac{1}{2}$ in. plump between them. Next, make a box $15\frac{1}{2} \times 15\frac{1}{2}$, without top or bottom, and make it of $\frac{1}{2}$ inch boards, 3 inches wide. This is what cider-makers call a form or hoop, and is used for laying up the cheese. Now get burlap, such as the factories use for baling their cloth. Cut it into pieces, 28 or 30 in. square. Five of these is enough, as 5 layers will fill the boiler. Now take the old comb and pound it up fine, lay down a rack, put on the form, spread on a burlap, and fill up with the comb; then double in the sides, raise all from the form, and place in the boiler. Fill 5 racks in this way, and put the 6th on top, and a board for a follower on top of this, with a block 6 or 8 in. square which should be fastened to the follower. Perhaps all this will make the boiler more than full, but it will soon settle down when it comes to a boil. A better way is to put the boiler on the stove with 2 pails of water in it, before you commence. This saves time in heating, and the layers can be lowered in with hooks made of wire.

As soon as it has boiled 15 or 20 minutes, it is ready to press, which I do with a small jack screw. You need a small frame, of course, to press in; this can be made with a screw in the upper beam, if desired, but the jack screw does just as well. Now when your wax has boiled enough, take the boiler from the stove, place it under the press, and turn down your screw, and you will soon find the wax on top of the water. Proceed to draw it off by the spout. You will need a pailful or two of hot water to fill up with as the wax runs off. The wax should be all removed before the screw is loosened up, as it will stick to the racks and burlap. Skim the wax off with a paddle made of thin board or tin. If the screw is loosened once or twice, and the water allowed to soften up the pumice, it will get it out cleaner.

You need not be more than 15 or 20 minutes in pressing out a cheese, after it is boiled. A press of the size I have described will get out from 10 to 20 lbs. to a pressing, of as nice wax as you ever saw. If you have a good stove to heat on, you need not be more than an hour, or $1\frac{1}{2}$ hours to a pressing, which gives a capacity of from 75 to 150 lbs. per day, more than 10 times the capacity of the steamer process; and again, it gets the wax out much cleaner. If you do not believe this, run some through the steamer, and then put it through a press of this kind. We had the bottom of a bee hive full of pumice which had been through the steamer, and all the wax had been got out that we could get out by that process; then we put it through the press and got out 10 lbs. more. I tried the steamer for 3 or 4 weeks, and became disgusted with it; it worked so slow. I got out more wax the first day after I made the press than I could in 10 days with the steamer.

Now if you want to make a press after this pattern, you are at perfect liberty to do so, as for as I am concerned. The boiler and racks will not cost over \$3.00. WM. W. CARY.

Colerain, Mass., 1878.

We are much obliged to friend Cary, and I have no doubt that his press will bring out much more wax than the wax extractor does. The plan we have adopted is something similar, but we do not use a press.

OUR OWN WAY OF RENDERING WAX.

Get an ordinary wash boiler that sinks into the fire place of the stove. Put some strips of wood across, to keep the bags of wax from resting on the bottom and burning. These strips are to be of such length that their ends rest on the ledge of the bottom part of the boiler. A frame similar to that mentioned by Mr. Cary would be very convenient; we have been using one made of wire cloth, but it is hardly stiff enough. Now, have some bags made of coarse strain-er cloth, such as is known in the dairy regions as cheese cloth. These should be about the size of grain bags, but not as long. Squeeze your wax into balls in the hands, getting it into as small a compass as may be, and put it in the bags. Have bags enough to contain all the wax. These bags cost very little, as the cloth is only 8c. per yard. When you have as many packed into your boiler as you can get in, while the water is boiling, put on a board, with a heavy piece of iron on it. When the wax is all pressed out of the bags, the iron should be beneath the surface of the liquid; if it is not, add more water, or make the weight sink deeper. The wax, of course, is found swimming on the surface, and may be dipped off, or, if much is to be worked in this way, it will pay to have a spout or gate, as suggested by friend Cary. It is so difficult to clean the bags from the gum and propolis always found with old black combs, that I think I should throw them away, and use new ones each time. The more compactly the wax is put into the bags, the less number of bags will be needed.

Where one has cappings from the extractor, they should not be put with old dark combs, but worked by themselves, for they are almost pure wax. I have seen cappings from new white combs produce wax so nearly white that it would readily sell for bleached wax.*

The wax of commerce, when it is bought in quantities, is composed of cakes of all sizes, and of all colors from nearly white to nearly black, the intermediate shades comprising almost all the colors

*JUNE, 1881.—We have just adopted a plan for rendering old combs by the use of steam, that is vastly ahead of all these given, both in quality of wax and rapidity of work. It is simply a large honey-barrel having a basket made of queen-cage wire cloth suspended in it by a hoop that rests on the top of the barrel. A steam-pipe throws a strong jet of steam into this basket, and all one has to do is to shovel in the old comb in any quantity. The wax is found in the water below, and the refuse matter remains in the basket. The idea was partly furnished me by my friend D. A. Jones, of Beeton, Canada.

of the rainbow. Where it contains much refuse, it can be improved by putting it through either of the presses described above, and, in fact, almost any wax can be made cleaner and brighter by being put through the extractor two or three times. It has been our practice, in using it for fdn., to select the cleanest and nicest cakes for the thin fdn., to be used in the honey boxes, and the darker for the brood fdn., for the latter, I think, is less liable to sag and stretch than the very light yellow. Wax, as it comes from the hives, varies greatly in hardness. Some specimens are so soft that it seems as if they could not stand the weight of the bees at all, when made into sheets of fdn., while others are so hard that it is difficult to roll them at ordinary temperatures. If I am correct, the soft wax can often be worked into comb better than the hard. This is because it does not continue to soften, in the same proportion, as the temperature is raised. As an illustration, take paraffine. It is too hard to be worked ordinarily, but if warmed to the right degree, it makes beautiful looking fdn. If given to the bees during moderate spring weather, it is worked out into beautiful comb, and filled with honey; but when the extreme heat of midsummer comes, these beautiful looking combs, with their precious load of sweets, will soften and fall down into a heap. This fact I learned by experience that cost me a hundred dollars or more. The admixture of the least particle of paraffine is sure to give the wax a tendency to stretch and sag, and, on this account, I would not advise it; for it is a serious matter to send out fdn. that may endanger the life of a colony, by breaking down when heavily filled with honey. I have been told that, with wires stretched at frequent intervals, say every inch through the frame, it can be used without danger; and, as the bees work it out into combs faster than I ever saw them work natural wax, it may be practicable to use it in that way, after all, when mixed with a sufficient quantity of wax to make a sure thing of the side walls. After a comb has been once used for brood, the cocoons left give it sufficient strength and firmness to be ever afterward safe.

CLEANING WAX FROM UTENSILS.

Perhaps the readiest means is to immerse them in boiling water until all the wax is thoroughly melted off, then drain, while kept hot, until the wax which adheres to them when being lifted from the water is thoroughly melted, and can be wiped off

with soft newspaper. Where the article cannot be easily immersed, benzine or a solution of sal soda will readily dissolve the wax, so it may be cleaned off with a cloth. Benzine dissolves wax almost as readily as water dissolves sugar.

Caution in handling wax. I have spoken about order, care, and cleanliness, in handling honey, candy, etc.; now, my friends, it is a much more serious thing to daub melted wax about the house, on the carpets and on your clothes, than it is to daub either honey or candy. You can very easily spoil a dollar's worth of clothing while fussing with 10c. worth of wax, as I know by experience. When you commence, bear this in mind, and resolve that you are going to have things clean and neat at every step, no matter what the cost. Newspapers are very cheap, and it takes but a minute to spread them all around the room where your wax may be dropped. Have every thing, at every stage, in such order that you would not be ashamed of your work, should visitors call unexpectedly. The greatest trials I have ever had with boys and girls, in trying to teach them neatness and order, has been with those in the wax room; they will drop little bits of wax, and step on them. My friend, if you cannot learn to avoid stepping on bees, or dropping and stepping on wax and honey, while you are at work, you would better stop right here, and give up trying to be a bee-keeper. I do not know but you might also give up all thoughts of ever trying to be happy anywhere. You certainly cannot be wanted in this world, and I am not sure you will be wanted in heaven, if you go about carelessly treading on things, and sticking and daubing honey and beeswax every where you go.

The article below from the *American Bee Journal* of Oct., 1867, covers so many important facts in regard to wax, that I copy it entire:

WAX.

This is an organic product of both animal and vegetable origin, and occurring even as a mineral, though in this case also, its original source is undoubtedly vegetable. The common properties of the substances included under this name are fusibility at a moderate heat; burning with much flame; insolubility in water, and solubility in alkaline solutions, alcohol, and ether; and in most cases a peculiar lustre, to which the name of "waxy" has been given. The most important of these substances is beeswax, which was for a long time supposed to be simply collected by the bees from flowers, but has proved by the experiments of Huber and the Hunters, to be secreted by them. It is obtained in the cakes in which it appears in commerce, by boiling the comb from which the honey has been drained or

pressed out in water, with frequent stirring, that the wax may not burn. When completely melted, the wax is strained by pressing through hair bags, and received in a vessel of cold water, which serves to cool it and prevent it from sticking. This is repeated two or three times, the bags increasing in fineness, and the wax is finally melted without water, and poured into moulds wider at the top than at the bottom, and wetted to prevent sticking. After being filled the moulds are kept in a warm room till the wax has solidified, as otherwise the cakes are apt to crack in the middle. This process is however tedious and somewhat wasteful, and various attempts have been made to find a more expeditious one, of which Mr. Bagster's appears the most simple. The combs are placed in a conical earthen vessel filled with a mixture of one ounce of nitric acid to a quart of water. This is set over an open fire till the wax is completely melted, when it is removed from the fire and allowed to cool gradually. The product becomes divided into three layers, the upper one pure wax, the lowest chiefly impurities, and the middle containing sufficient wax to be worth adding to the next melting. A marketable wax is thus obtained at a single operation, without straining or pressing. Beeswax obtained by either of these processes is yellow; has an agreeable, somewhat aromatic odor, and a slight but peculiar taste; is rather soft and unctuous, though firm; has a granular fracture, but when cut shows the characteristic waxy lustre; does not adhere to the fingers, or to the teeth when chewed; is rendered soft and tenacious by a moderate heat; melts at about 142° F.; and has a specific gravity of 0.960 to 0.965.

Wax is often adulterated with earth, meal, rosin, etc. The first two render it brittle and grayish, and may be detected and separated by melting the wax, when the impurities may be strained out. Rosin makes the fracture smooth and shining instead of granular, and may be dissolved in cold alcohol, while the wax remains untouched. Tallow or suet renders the wax softer, and gives it an unpleasant odor when melted.

Wax is bleached by causing it, when melted, to pass through a perforated trough upon the surface of revolving wooden cylinders half immersed in water, by which it is formed into films, which are then placed on webs of canvas raised from the ground, and exposed to the action of the weather until perfectly white. It is, however, generally necessary to repeat the process so as to expose fresh surfaces before the wax can be completely bleached; and care must be taken to finally remove the wax from the webs of canvas only in dry weather, as if it is done in damp weather, it retains a grayish tint, which much impairs its value. The films are finally melted and cast into thin circular cakes, known commercially as "virgin wax." When bleached by means of chlorine or its compounds, the color is destroyed, but the wax is rendered unfit for many purposes, and especially for candles. Another method of bleaching is to add one pound of melted wax, two ounces pulverized nitrate of soda, and stir in by degrees a mixture of one ounce sulphuric acid and nine ounces of water. When all the acid is added, it is allowed to partially cool, and the vessel is then filled up with boiling water, to remove the sulphate of soda and acid; it is then quite white, translucent in thin slices, shining, harder and less unctuous than the yellow, without taste or smell; becomes soft enough to be kneaded at 85° to 95° F.,

and fuses at 150° to 155° F., though it will remain liquid at a somewhat lower temperature; by great heat it is partially volatilized and partly decomposed, the vapor burning with a clear bright flame; it is insoluble in water, but slightly soluble in boiling alcohol and ether, which deposit most of it on cooling; easily so in the essential and fixed oils; and can readily be combined with rosin by fusion. It is very frequently adulterated with spermaceti, which destroys its peculiar lustre and renders it softer and more fusible; it is also adulterated with stearine, which may be detected by the odor of fat or tallow evolved when the wax is highly heated, and by the crumbly texture which it imparts.

White wax is composed of two principal substances: myricine, which is grayish white without crystalline texture, fusible at 127° F., and almost insoluble in boiling alcohol; and cerine or cerotic acid, which crystallizes when pure, in delicate needle-like crystals, fuses at 172° F., is much more soluble, constitutes about twenty-two per cent of the entire weight of the wax, and has for its formula C 54, H 54, O 4. Wax also contains four or five per cent of a substance called ceroleine, which is soft, very soluble in cold alcohol and ether, and melts at 83° F.; and by dry distillation, and by the action of acids and alkalis on cerene and myricine, a large number of peculiar organic compounds may be derived from it. A specimen of beeswax from Ceylon was found by Mr. Brodie to consist almost exclusively of myricine.

Beeswax, though produced in almost every country in the temperate and tropic zones, is an article of foreign commerce in comparatively few. The European supply is principally derived from the Baltic, the Levant, Africa, India, and the United States. The Portuguese province of Angola, in Africa, annually sends to Europe about 1,500,000 arrobas or 47,772,000 lbs. Japan also exports much. In the United States it has long been an important article of production and export. The census of 1840 gives the value of the product at \$628,303, which would be about 2,000,000 lbs.; that for 1850 states the value of wax and honey to have been 14,853,790 lbs., worth \$2,736,606; and that for 1860 gives 1,357,864 lbs. of wax alone. The exports in 1859-60 were 362,474 lbs., worth \$131,803. In 1861, 238,553 lbs. were exported from New York. In 1860 more than five-sixths of the exports were to France, England and Brazil.

Besides beeswax, two kinds of wax of animal origin enter into commerce. The first, the insect wax of China, is found coating the surface of the *Rhus succedaneum* and some other trees. It is the product of a very small white hemipterous insect (*Coccus Sinensis*), which about the beginning of June climbs up the plant and feeds upon it, depositing the wax upon the branches as a coating which resembles hoar frost. This is scraped off towards the end of August, melted in boiling water, and strained through a cloth. It is white and crystalline, resembling spermaceti, but harder, more brittle, and more fibrous, fuses at 181° F., is but slightly soluble in alcohol or ether, dissolves readily in naphtha, and has for its formula C 108, H 108, O 4. It does not contain cerotic acid ready formed, but by fusion with potash is decomposed into a mixture of it with a substance called cerotene (C 54, H 56, O 2.) The Chinese call it fe-la, and employ it for making candles sometimes alone, but more commonly mixed with softer fats and as a coating for other more easily fusible material, in order to prevent guttering. It is often colored red with alkanet root, or green with

verdigris. It has been introduced into England for the manufacture of composite candles, and is found to answer the same purpose of beeswax, of destroying the crystalline structure, or "breaking the grain" of stearic acid. In China it is also employed as a medicine. The French have introduced the insect into Algeria. The price of wax at Nigpo some years ago was 22 to 25 cents per pound, and the annual production was estimated at 400,000 lbs. Another wax of animal origin is the Andaquiss wax of South America, which is produced by a small insect called *avesa*. It melts at 171° F., has a specific gravity of 0.917, and according to M. Lewy contains fifty per cent of ceroyline or palm wax, forty-five per cent of ceroxine or sugarcane wax, and five per cent of an oily substance.

Of the vegetable waxes, the Japanese, the palm wax of New Granada, and the myrtle wax of the United States are the principal varieties. The first is as white as bleached beeswax, more brittle, less ductile, and breaks with a smoother and more conchoidal fracture; its specific gravity is rather less; and its melting point is about 127° F. Its chemical composition is not definitely known. The berries yielding it grow in clusters like grapes on trees from 15 to twenty-five feet high, and when gathered are roughly washed and boiled in water, when the wax rises to the surface, is skimmed off, and formed into cakes weighing about thirty pounds. It is said to require protracted bleaching before it is fit for market. Small quantities have been shipped to Europe for many years past, but it is only within four or five years that it has been exclusively employed for candles, &c. The amount exported is large and continually increasing. In 1859 a single cargo of 1,170,000 lbs. arrived in England. In 1860 the price at Nagasaki was \$11 to \$12 per pecul, or 8½ to 9½ cents per pound. The palm wax of New Granada, (ceroxylene) is obtained from the *Ceroxylon andicola*. The scrapings from the exterior of the tree are boiled by the Indians, and the wax rises to the surface. It is grayish white when crude, and after purification by digestion in alcohol is yellowish white, almost insoluble in alcohol, and fuses at 161½° F. The tree has been introduced into Algeria. Carnauba wax is derived from a palm growing in northern Brazil. It is soluble in alcohol and ether, and fuses at 182° F. The ocuba wax of Brazil is derived from kernels of the fruit of several species of *myristica*, especially the *M. ocuba*. It is yellowish white, soluble in boiling alcohol, and melts at 98° F. The *Bicuhiba* wax, also from Brazil, comes from the *M. Bicuhiba*, is yellowish white, soluble in boiling alcohol, and fusible at 95° F. The myrtle wax, which for many years has been an article of commerce in the United States, also known as "candleberry wax" and as "bayberry tallow," occurs as an incrustation on the berries of the wax myrtle or bayberry. The berries are enclosed in bags of coarse cloth, and kept immersed in boiling water until the wax collects on the surface, which is then cast into moulds and sold without further preparation. It varies in color from grayish yellow to deep green, has a balsamic and slightly aromatic odor, a specific gravity of 1.004 to 1.006, fuses between 117° and 120° F., and is much harder and more brittle than beeswax. It is composed, according to Mr. G. E. Moore, of one-fifth part of a substance called palmitine, which exists in palm oil, Japanese wax, &c., and four-fifths of palmitic acid, with a small quantity of lauric acid. This wax appears, as a candle-making material, to be worthy of more attention than it has hitherto re-

ceived. Its illuminating power is scarcely inferior to that of the best beeswax; it hardly costs one quarter as much, can be obtained more free from color, is easily bleached, and from its superior hardness can be cast instead of being moulded by hand like beeswax. The plant grows abundantly on the poorest soils along the coast of New England. Plantations of it have long existed in Europe, and its cultivation has lately been tried in Algeria. The berries of *myrica quercifolia*, natives of the Cape of Good Hope, growing on dry sandy plains along the coast, also yield a greenish wax, which can be bleached, and when made into candles gives a very good light. The sugar cane yields a wax called ceresine, which is soluble in boiling alcohol and slightly so in boiling ether. The sorghum also secretes on the surface of the native stalks a white resinous powder, from which candles could be made. A waxy substance called suberine has likewise been obtained from cork.

Several mineral substances resemble wax in physical properties, the principal of which are ozocerite and hatchettine. The principal use of the different kinds of wax are: 1, for the manufacture of candles, either from pure wax, the consumption of which is especially great in Roman Catholic countries, or of wax mixed with stearic acid, palm oil, &c., as in composite candles; to which purpose every variety, whether animal, vegetable, or mineral seems to have been employed in different countries; 2, as a vehicle for colors in certain kinds of painting, and as a protecting coat for them; 3, for giving a polish to furniture and floors, for both which purposes it is generally used in France and other parts of southern Europe; 4, in medicine, in which beeswax is employed as an internal remedy against diarrhoea and dysentery, as an ingredient in almost all ointments, cerates and plasters, and also for filling carious teeth; 5, as a lute or cement of much utility for chemical and other purposes, and also as an impervious coating for vessels formed of porous materials; 6, as a material for modelling; and 7, formerly for seals instead of sealing wax.

The process given above, of bleaching by the use of chemicals, I have tried repeatedly, but although I procured the purest articles, and used the utmost care, I have never been able to get wax enough whiter to make it any object, to say nothing of making white wax of it. The sun bleaching is the plan generally used, if I am not mistaken, but as I have said before, we certainly do not want white wax for use in the apiary. The plan of cleansing wax by the use of acids or vinegar is well known, I believe, but, as a general rule, I think, it is more trouble than the plans I have given. Our friend Doolittle sent us some remarkably pretty wax, that he said was cleansed by the following process, which is taken from *Quinby's Bee-Keeping*, edition of 1866, page 283:

By adding an acid to the water in which the wax is melted, it may be separated much more readily. A quart of vinegar to a gallon of water, or a small spoonful of nitric acid is sufficient.

ADULTERATION OF WAX.

The white wax of commerce, I am sorry

to say, is generally largely adulterated with paraffine, which very much injures it for making fdn., as I have before explained. Within the past two years, another substance, called ceresin, has been imported in large quantities, and bids fair to take the place of wax to a great extent for many purposes. It, however, like paraffine, when used for combs, stretches so much, as to make it worse than useless. Both of these substances can readily be mixed with wax, and the problem is to determine when there is such admixture. My method has been simply to chew a piece of the suspected wax; if adulterated, even slightly, with either, the wax will chew like gum; whereas, if pure, it will soon crumble and break to pieces in the mouth, and will not make gum at all. In buying the ordinary cakes of wax of commerce, we are pretty safe from adulteration with either of these, or at least we have been up to this time (June, 1879), but I am daily expecting to find counterfeit cakes of dirty wax, all sizes and colors. I am sorry to say, that there is a species of fraud practiced by the country people themselves, by adding tallow to their cakes of beeswax, but, happily, this is not very common. The presence of tallow is detected, by both taste and smell, and especially, by chewing, for a very small per cent of tallow softens the wax quite perceptibly, and makes it like grafting wax. Where we suspect a cake of wax, I have sometimes made a little of it into a piece of fdn., and hung it in a hive. If the cells made are regular, and do not stretch out so as to give the oblong appearance, I pronounce it pure wax; for, so far as I know, there is no other substance known that will stand the heat of the hive, as will wax, without bulging and stretching.

WHITEWOOD (*Liriodendron Tulipifera*). This is often called the tulip tree, I suppose from its tulip-shaped flowers.

After I had written the above, I concluded I did not know very much about the whitewood, especially the blossoms, and as I had directed our engraver to copy engravings of the ROCKY MOUNTAIN BEE PLANT, the MOUNTAIN SAGE, and TEASEL, from *Cook's Manual*, I concluded I would get my observations and pictures this time, from nature; and so I deserted my type-writer and traveled off into the woods. At length, I found a tree, but there were only buds to be seen, not blossoms. It must be too early in the season; but hark! whence come those sounds of humming-birds, and humming

bees? Whence, too, comes that rare and exquisite perfume? I looked higher, and away in the misty top of the tree, I thought I discerned, by the light of the setting sun, multitudes of bees flitting about. Oh that I were just up there! I looked at the rough trunk of the tree, and meditated that I was a boy no longer, but a man of 40, or would be in a few months more. I might get up to that first limb,—after a good deal of kicking and puffing, I got up there. The next was a harder pull yet, but soon the limbs were thicker, and finally, I began to crawl upward with about as much ease as our year and a half old baby goes up stairs, whenever she can elude maternal vigilance. Up, up, I went, until, on looking down, I really began to wonder what that blue-eyed baby and her mamma would do, should my clumsy boots slip, or a dead limb break unexpectedly. Now I was in the very summit of the tree, and oh, what a wonderful beauty I saw in those tulip shaped blossoms, that peeped from the glossy green foliage all about me! No wonder there was a humming. Bumblebees, gaudy colored wasps, yellow Italians, and last, but not least, beautifully plumaged humming-birds, were all rejoicing in a field of sweets. Every now and then, one of the latter paused before my very face, and, as he swung pendulously in mid air, winked his bright little eyes, as much as to say, “Why, what on earth can you be doing away up here in our domain?”

I picked off the great orange-colored, mottled blossoms, and looked for the honey. I presume it was the wrong time of day to expect much, but the inside of those large petals, seemed to be distilling a dark kind of dew, that the birds and insects were licking off. It tasted to me more like molasses than honey. On the next page our engraver has tried to show you what I saw in the tree top.

As the sun had gone down, I commenced in rather an undignified way to follow suit, and after resting a little, limped home. Although I was stiff and sore, I carried an armful of whitewood blossoms to surprise the good folks who, probably, had never dreamed of the beauties to be seen only in the tree tops.

Our friends in the South have a great deal to say about what they call “poplar honey”; and, if I am correct, the poplar is the same tree which we call whitewood. Its blossoms with them in April and May. I know what time it blossoms here, for I thought about its being the 27th of May, when sliding down out of that tree, A few days ago, I

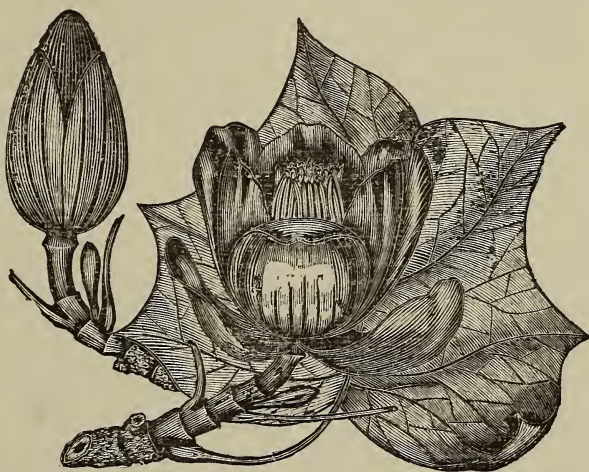
received some bees from G. W. Gates, of Bartlett, Tenn. The combs were filled and bulged out with a dark honey, such as I have described, and the bees had built fins of snow white comb on the cover of their shipping box. From this, I infer the honey must be yielded in great abundance in those localities. I have seen it stated, that the large flowers sometimes yield a spoonful of honey each. As the tree is often used for ornament, I make the following extract from *Fuller's Forest Tree Culturist*.

LIRIODENDRON TULIPIFERA (*Tulip-tree Whitewood*).

Leaves smooth, on slender petioles, partially three-lobed, the middle one appearing as though cut off; flowers about two inches broad, bell-shaped,

from the West or East. The latter is of a light greenish color, grain not so smooth and soft, and sometimes rather tough. To produce good timber, the soil should be deep and rich, and on such the trees will grow very rapidly. The wood is little used, except for the purposes mentioned above, consequently it is only large trees that will be of much value. It is one of the most beautiful ornamental trees we possess, growing in a conical form, and producing an abundance of its beautiful tulip-shaped flowers in spring. The roots are soft and sponge like, and it requires great care in removing to insure success. Frequent transplanting in the nursery is the best method for preparing the trees for future removal.

The question is often asked, "Is white-wood good for bee-hives?" It may do for sections and honey boxes, but it is very un-



LEAF, BUD, AND BLOSSOM OF THE WHITEWOOD, OR TULIP-TREE.

greenish yellow, marked with orange; seeds winged, in a large cone-shape cluster, which falls apart in autumn. The figure shows a single seed as it appears when separated from the mass. It blooms in May and June, and the seeds ripen in late summer or early autumn, and should be sown as soon as ripe in good, moderately dry soil. They may remain in the seed bed two years, if desirable, but should receive a slight protection the first winter; tree of large size, sometimes 130 feet high, with a very straight stem; wood light color, greenish white, soft and light, not hard enough to receive a polish. It is much used in cabinet work, and for making panels for carriages, and for any inside work where toughness or a hard surface is not required. There is perhaps no native wood that will shrink more in seasoning than whitewood, for it not only shrinks sideways, but endways as well; but when once thoroughly seasoned, it remains fixed, and does not warp or twist like many of the hard and tough kinds of wood. There is also much difference in character of the wood coming from different sections of the country, and mechanics who are conversant with the various kinds and localities will readily tell whether specimens came

satisfactory for hives, for the reasons given in this extract.

WINTERING. My friends, if you have been over faithfully what I have written in the preceding pages, you are nearly ready to sum up the matter of wintering with me, with but few additional remarks. Under the head of **ABSCONDING SWARMS**, in the opening of the book, I cautioned you against dividing, and trying to winter weak colonies. See *Absconding in Early Spring*, under the head mentioned. Also see *House Apiary*, under head of **APIARY**. In regard to keeping bees warm through the winter with **ARTIFICIAL HEAT**, see that head. In regard to the effect of different kinds of food or stores on the welfare of bees during winter, see **DYSENTERY, FEEDING AND FEEDERS, CANDY FOR BEES, and HONEY DEW**. In regard to fixing the size of the entrances to hives and keeping them from getting clogged with dead bees, see **ENTRANCES TO**



HIVES, VENTILATION, and PROPOLIS. In regard to starving bees, and taking away their sealed stores, allowing them only unsealed, late, fall honey, see EXTRACTORS. For a consideration of the different sizes and shapes of frames for wintering, see NUCLEUS.

After you have gone over all these, I think we are ready to consider wintering intelligently.

WHEN TO COMMENCE PREPARING THE BEES FOR WINTER.

If either bees or stores are lacking, they should be supplied during warm weather, so that all may be quiet and ready for the winter doze which nature intends them to take, long enough before winter weather has actually set in. In this latitude, I should advise examining all hives the first of Sept.

In the first place, be sure that you have bees enough in each hive to winter; if you have not, unite until every colony is strong. I would not undertake to winter any colony, unless it would cover well, as many as 4 L. frames. If your colony has not as many as 4 good combs, they must be supplied with fdn., and made to build them out. If they are to do it in Sept., you and the bees both must stir yourselves, I tell you. There must be no forgetting them, and you must be at home every day, to attend to it. Close the space up by chaff division boards, until there is just comfortable room for the 4 frames, put in your fdn. where the combs are lacking, and then feed them every night, from a half pint to a pint of food. Open the hive every day or two, and see how things get along. You want a good queen and lots of brood started. Make them prosper, and build up. You will soon learn to know what prosperity means. They should be rearing brood, building comb, and getting full of bees, precisely as they do in June. For winter stores, I would use granulated sugar (SEE FEEDERS AND FEEDING; feed them about half a pound every night, until their combs are full.⁹⁴ If you have the 4 combs average about 5 lbs. each, you will be on the safe side. If your colony is heavy enough to cover 6 combs, clear out to the ends, during a cool night, they will perhaps need 6 combs filled so as to average 5 lbs. each. When you get the bees, and the stores, with the chaff cushions on each side, they are all ready to winter, by simply putting a thick chaff cushion over them. This arrangement is not as good as a regular chaff hive, but it has answered for several seasons past, quite well. If the winter is very severe, a colony

that would cover densely 5 or 6 combs would be much safer than a smaller one. The main points are, a brood apartment closely packed with bees, and plenty of good sealed stores. With these two conditions alone, the bees will generally winter all right, even in a hive made of inch boards. If the bees are not enough to fill the hive, reduce the size of the apartment until they do fill it. This is usually done by a division board. If the walls of this wintering apartment are made of thin wood, the bees will then keep the thin walls of the hive, as well as themselves, warm all winter, and we shall then avoid the loss that often ensues by bees continually freezing in the outside combs. This is the purpose of the chaff hive; it is of about as much use to put chaff and straw over the outside of great heavy hives, as it would be to put your bed clothes on the roof of your house, instead of next to your body, on a cold winter night.

VENTILATION AND ITS RELATION TO FROST AND DAMPNESS.

I think the subjects of chaff packing and ventilation are not clearly understood. Bees become damp because the walls of the hive are so cold as to condense the moisture from their breath. If these walls did not become cold, no moisture would condense on them, and no dampness would accumulate in the hives. On a cold winter night, frost sometimes accumulates on our windows until it may be $\frac{1}{4}$ inch in thickness. The amount of ice depends on the difference in the temperatures of the air on the two sides of the glass. If the air outside should be below zero, while that inside is 70 or 80, and at the same time is fully charged with moisture, from the kitchen, perhaps, as is the case frequently on washing days, or even from the breath of many persons, the accumulation of ice on the glass will be very rapid. If the room is kept warmed up the ice will melt, and the water will run down, until the floor becomes quite wet. While running a small engine one winter, in a room having large glass windows, the water accumulated so rapidly on the glass that we had to attach a tin trough to the window sill, to catch it, and in a little time we caught a pailful from the end of the spout. The cause is this; warm air takes up and holds in solution a large quantity of water. This water is of course invisible, and we have scarcely any means of detecting it so long as the temperature of the air is unchanged by coming in contact with colder substances, or currents of air of a lower temperature. If the walls of the

room are kept warm, there will be no perceptible dampness. Let them be chilled, as in the case of the window pane, however, and we shall have the warm air dropping its water the very minute it comes in contact with the cold surface, in exactly the same way that dew is deposited, on a hot summer day, on the outside of a pitcher containing cold water. The process with the window goes on, because currents of air are started both on the outside and inside of the glass, by the heat that passes through the glass. To make this plain, let A, in the cut below, represent the pane of glass.

The arrows represent the course of the currents of air. The greater the difference in temperature between the outside and inside, the more active are these currents, and the greater is the deposition of dew or ice, on the surface of the glass on the inside.



HOW BEE HIVES BECOME DAMP.

In the warm room you will see that the air is chilled as it strikes the window, and then falls because it is heavier; this gives place to more warm air, and keeps up the circulation. On the outside, the cold air next the window becomes warmed, and rises on account of being lighter, and this keeps up a similar action on the outside, the direction of the currents being reversed. Thus you see how the water from the air is condensed on the windows, and goes down into the pail. The air in the room would soon lose its moisture, were not more supplied from the breathing of living persons, or from the kettles on the stove, from damp air rising from the cellar, or from something of that kind. I need hardly state that the same operation goes on in the bee hive, especially, if the walls are thin, and the hive at all tight. If the top of the hive is a thin honey board, with cold air above and warm air below, ice will be sure to collect over the cluster, and when it melts will dampen the bees. The sides of the hive will be covered with frost, and perhaps a heavy coat of ice, by the circulation of currents of air as I have explained. Now let us go back to the window, and place one of the chaff cushions I have advised for wintering, close against the window glass, on the outside. This will stop the outside circulation, and the light of glass will soon become warmed through to such an extent, that no ice, or dew either, will condense upon it. To make a further protection, suppose we put glass or boards

on the outside of the cushion, or, in fact, make two walls, with chaff between them as in the chaff hive. A good colony of bees would warm up the thin walls next to them, sufficiently to prevent either frost or moisture from accumulating on them at all. Now, if the walls all around the bees are thus protected with chaff cushions, they can not well get frosty on the outside, and thus accumulate either moisture or dampness on the inside. As a proof of this, I have wintered a colony nicely, with a covering of enameled cloth over them, that was almost absolutely impervious to air. To be sure, a thick chaff cushion was over this enameled cloth, or it would have been wet very quickly with the condensed moisture: in fact, several colonies became quite wet, during frosty nights in the fall, before the chaff cushions were put on. Now, if the bees are to keep these walls about them so warm that moisture cannot condense on them, the walls must be close to the cluster of bees, and certainly the material for them should be a non-conductor of heat, and they should be so thin, that they will readily warm through. Although it may not be absolutely necessary that the walls and covering should be of some porous material, which will absorb any chance moisture from the breath of the bees, it will perhaps be better that they should be so, and many experiments seem to indicate that straw or chaff is the best material for this purpose. For the reasons I have named, the old fashioned straw hive, which has for ages been emblematical of the honey bee, seems to be very nearly what is wanted to protect them in the way they seem to demand. The straw next to them is warm and therefore proof against condensation; it is thin, and hence easily warmed; is a non-conductor of heat; and while it may permit the air to pass through the porous walls slowly, it does not admit of a draft of cold air through the hive, as does a badly made wooden hive or one that has cracks or fissures.

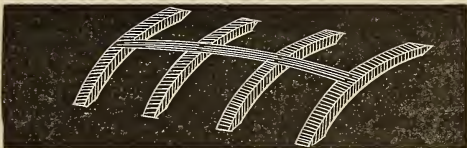
STRAW HIVES.

Ever since the advantages of straw hives for wintering have been fully demonstrated, attempts have been made to make hives of straw, to hold the movable frames in common use. Such hives have answered the purpose very well, but they are inconvenient, untidy, expensive to make, and not durable after they are made. As they cannot well be painted, they are soon destroyed by the weather; and if we make an outer shell to protect the straw, we have, virtually, a chaff hive, such as I have described. It is true,

we might have straw next to the bees, but straw does not present a clean, smooth surface such as we wish to have next to combs to have them built true, and I cannot discover by experiment, that the straw is any the less effective, with a thin board interposed between it and the bees.

HOW TO COVER THE BEES IN WINTER.

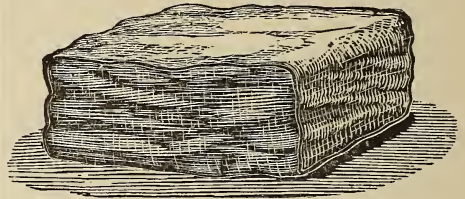
Strawmats to put over the bees have been in use many years, and with good results; but I have found it a difficult matter to have them fit so closely over the cluster as do the chaff cushions, and they are not so neat and tidy. The mats will always have more or less loose straws pulling off. For the reasons I have given, I do not think a hive with the straw exposed either to the bees inside, or to the weather outside, will ever come in vogue extensively. After having tried many different plans of covering the frames for winter, I have adopted a single sheet of burlap, or coarse bag stuff; but this covering is intended only to keep the bees down, and to keep them from soiling and biting the cushions, and not to furnish protection from the weather, unless it should be during the warmest summer weather. Under this, and right over the cluster, we have the Hill device, shown below, which is the same mentioned by Mr. Langstroth on page 287.



HILL'S DEVICE FOR COVERING THE FRAMES IN WINTER.

The sticks are sawed on a circle, from half-inch basswood. They are sawed on a curve that would make a circle of about 11 inches in diameter. The stuff is held at an angle when sawed, so the outer surface is something like the surface of a sphere. The two inside sticks are 9 inches in length; the two outside ones, only 8. The back-bone, as it were, is a strip of very light hoop-iron, like that used to hoop pails. It is about a foot long, which holds the ribs about four inches apart. Two wire nails are put through and clinched, at each stick. You set this on the frames, right over where the bees are clustered, then lay over the piece of bagging, or burlap, and fill the upper story with chaff. Up under these the bees cluster, and with sealed honey in the combs below, and chaff above them, they can hardly be in a better fix for winter. If they should need feeding

in winter, which never ought to be the case, put balls of granulated sugar and honey, stirred up together, right in this cluster. This device I think better than sticks laid across the tops of the frames, or any thing of that kind, because it does not leave interstices clear to the outside of the hive, and because it accommodates the bees in a sort of sphere-shaped ball, which extends down between these combs of stores.



CHAFF CUSHIONS.

Take two pieces of burlap, mentioned above, 20 inches wide, and the other way clear across the roll. As the burlap is 40 in. wide, our two pieces will be each 20 x 40. Well, these two make the cushion by sewing them together in such a way as to make one single endless seam, and I think that a look at the cut above will tell you how it is done, without any further explanation.

In sewing it, leave the last corner open until the chaff is put in. It is not to be packed in tight, but just loosely; and, in fact, we prefer them with the quilt not quite full. Recent experiments seem to indicate that 6 inches of chaff over the cluster may be better than a foot or more. It is pretty sure that bees have many times died from being too heavily "blanketed," as it were. The cushions should at all times be perfectly protected from wet or dampness, for this very soon rots and destroys the cloth.

FIXING THE CUSHIONS OVER THE BEES FOR WINTER.

That the cushion may fill the upper story, and leave no crannies or interstices to allow frost to get in, or, by any chance, allow bees to push their way up under the cover during warm days in the winter, you are to put about a peck of soft, loose chaff over the mat, when fixing the bees for winter. Spread it around so as to fill completely all corners and crevices, and if the brood nest is contracted by a division board, fill the empty space back of that with chaff. The loose chaff is to be kept there until the honey season opens, and you wish to use the upper story for surplus. If some of the chaff rattles down among the bees, it will do no harm, but rather good. If you want to open a hive push the chaff over to one

side. I would put in the chaff and cushions as soon as honey gathering is over, or as soon as the nights become cool.

BEST KIND OF CHAFF.

After trying a great many kinds, I have decided in favor of soft oat chaff. To get it free from dirt and the harder portions, I have had it run through a fanning mill, and collected that portion which was blown farthest from the mill. This is soft and warm to touch, and it is easy to imagine how bees, mice, or any thing else, snugly tucked up in it, might pass the winter dry, warm, and in comfort. To Mr. J. H. Townley, of Tompkins, Mich., I am indebted for the idea of using chaff for a protection in wintering.

HOW I LEARNED CHAFF PACKING.

If he is not the original inventor, he is at least entitled to the credit of bringing it prominently before the public. It was during the month of Sept., 1875, when he so strenuously insisted that I should try one hive on his plan, that I could not well help complying. The following are the directions he gave me, taken from the Nov. No., of GLEANINGS for that year.

Make the box water tight, so that no water can get in from outside, and large enough to give you a space of three or more inches between hive and box, on all sides and top of hive. Arrange the entrance so that it *cannot* get clogged with dead bees (old bees will die, no danger of ice), take off top board or cover, put two sticks an inch apart across the centre of frames for winter passage, cover with cloth or mat (we use old worn out grain sacks cut in pieces of suitable size), pack the space snugly with dry wheat chaff or finely cut straw (sawdust is not as good), and leave them there till fruit blossoms next year, or longer. On some cold freezing morning next April open this hive and notice the difference between it and those outside. See how warm it is, how nicely the bees are spread over the combs in all parts of the hive, while in hives outside, they are packed in a snug, compact, winter cluster, with more or less dead bees outside of the cluster, killed by the cold. We now have 60 stocks snugly packed in boxes, all ready for winter, where we shall leave them, with but little care and no anxiety for the next seven or eight months. We are so well pleased with our success in wintering and *springing* bees in these boxes for three seasons past, that we shall continue it until we do meet with disaster.

Friend Novice, please pack one hive away as above described, *now*, and give it a fair, impartial trial and oblige,—Yours truly, J. H. TOWNLEY.
Tompkins, Mich., Sept. 22, '75.

I prepared a hive exactly as he said. It was a fair colony, and they had an abundance of sealed stores, but it was no better than many others. I used an old grain bag, as he had directed, and it was so very old that the bees bit holes through it, and let the chaff sift down into the hive on them. With the exception of this trifling accident and the

chaff packing, the bees of this colony had the same treatment as the rest of the apiary. I will give you some extracts from GLEANINGS, in regard to this colony and some others, and bearing directly on this matter of chaff packing.

The following extracts are taken from Gleanings in Bee Culture, for 1875-76:

Nov. 20th.—We are trying five hives in the open air: the Quinby hive which contains about the best colony in the apiary, and would winter well without chaff or anything else; a 20-frame hive, which has two colonies in it; the hive with the burnt candy; and two other fair stocks to test the advantage of a close hive compared with an open one. One of the latter is to be tucked up snugly with a quilt, and the other is to be put on eight combs in the centre of a two story L. hive, with nothing over or around the bees, except the cover to keep off rain. Both are carefully weighed and neither have been "tinkered" with by late feeding. Double walls and chaff and straw packing have been so much extolled, we wish to try the opposite—no protection at all.

Feb. 8th.—It is warm again now, but we have just had a zero spell, and our colony that we purposely left with neither sides nor cover to their defenseless heads, except the cover to the upper story to keep off the rain, for the first time this winter seemed to be the worse for such treatment; in fact, about one-half were cold in death, martyrs to the cause of science. "So bees do really freeze," thought I: but an examination showed that they did not freeze, they only starved after all; for on one side of the comb where there was no honey, every one was dead, but on the other where there was an abundance of stores, they were all alive. There was plenty of honey in all the combs except where the dead bees were found; in this there was none for several inches, and to get what there was they were obliged to get out in the cold or over the top of the comb, neither of which they could do during zero weather. Now it may be said that winter passages in the combs would have saved them; but even if they would, it will be cheaper to have plenty of bees, a good, generous sized warm quilt nicely tucked up over their heads, and a division board to reduce the size of the hive for wintering, to as small a space as consistent with an ample supply of food. All the rest of our colonies are in fair trim, and those in the house apiary as yet, scarcely seem to feel the winter at all.

Apr. 26th.—Perhaps the best colony we have, is the one in the Quinby hive that was packed on all sides and over head with chaff, *a la* Townley. They were so strong they would probably have wintered well any where, for we tried to get them to work in the boxes and failed; consequently they had every thing full of nice, sealed, clover honey. Now I never saw a hive having too much stores, notwithstanding all that has been said about it. I have tried the effect of too little, and know just what it does; now, I propose trying what the effect of too much will be. Our next best colony is the one in the hoop* hive, and they have been steadily increasing in numbers since Feb. Third best, colony with imported queen, in house apiary, on north side. Cannot see that it makes any difference whether stocks are on north or south side. I should be glad to add that the several dollars' worth of oil that has been used keeping the house apiary warmed for the past month has been of some sort of benefit to the brood, but really, the bees outside that have taken their chances are just about as well off. The colony left with nothing over them finally died outright.

It is now May 9th, and the bees in the house apiary are going so rapidly that I fear none will be left. Those outside are most of them building up, but a few of the weakest are yet going down with the well known spring dwindling. Now this Quinby hive that has the chaff over it is, as I have before said, considerably the best colony in the apiary; they are out first in the morning, and fly when it is cold and rainy, and so far as we can see, have not lost a bee; to tell the truth, they are so covered up that I could not open and overhaul them if I would, and perhaps that is one secret of their prosperity. Day before yesterday, while I was walking near the hive, a bit of chaff flew out of the entrance as if impelled by a draft of wind. "Halloo!" said I, "have you really become so strong as to send out a

current of air for ventilation?" and I approached and held the back of my hand before the entrance. Sure enough, there was a steady, strong blast, and what astonished me more, it was so warm that it seemed almost as if it must come from an oven.

I at once proceeded to my other hives, and not a breath of air could be perceived coming from the entrance of even the strongest. I went back to the Q. hive and pushed my hand down into the chaff, and long before it reached the bees, the warmth was very apparent; as I touched the cloth that covered the combs I made the remark that I must have touched the cluster; but as I slid my hand to the other end of the hive and then over and around the sides, I was obliged to admit that the cluster either filled 8 of the large Q. frames, or that the chaff had the astonishing property of so confining the heat that the whole hive was warmed up to a temperature that reminded one of handling a sitting hen. Perhaps it would be well to state here just how the hive was prepared last fall. The hive is wide enough inside to hold 16 frames side by side, and the side boards are tall enough to hold 16 more set on top of the lower ones. Well, the directions Mr. Q. sent with the hive were, to remove all but 8 of the frames for winter, and to turn these 8 frames at right angles from their usual position, so that, when set in the middle of the hive, there would be a space of about 4 inches left on all sides for the chaff, etc., and over the top of the frames, a space of nearly a foot. Now if a Quinby hive prepared in this way will always winter like this one, why has the plan been abandoned? I once wrote in regard to the matter to Mr. Elwood, I think, and if I am correct, his reply was that the plan did not succeed so well generally as wintering in the cellar. At all events, in Mr. Q.'s neighborhood, the plan of out-door packing seems to have been pretty generally abandoned in favor of cellar wintering, notwithstanding the hive used (Q.) is most excellently adapted to being packed. Now I cannot help wondering *why* they failed. If it were possible to have 100 stocks in the condition of this one, by the 1st of May, bee-keeping would be perfectly "splendid," as the little girls say; and such colonies would be cheap, even if it cost \$10.00 to put them in the necessary condition in the fall. If our friend Townley can and does winter a whole apiary in this way every time, why have others failed? It is true, our friend Butler *did* insist that I was stubborn in the matter,

*This hoop hive was one of my hobbies in 1875. The idea was, to give bees the same amount of ventilation in a wood hive, that they would have in a straw one; the hive was therefore made of slats placed at an angle so they would shed rain, but the walls of the hive were less than $\frac{1}{4}$ inch in thickness. Strong colonies wintered in such hives, but they kept away from the thin open walls, not only in winter, but in summer also; for they would not seal comb honey, when placed next to those cool outer walls. A half inch board was next tried, but the bees showed more aversion to that than they did to an inch board. Next, I tried a half inch board with a cushion against it, and found the honey was sealed up better next to this, than next to the inch board. From these experiments, demonstrating that chaff cushions are needed in summer as well as winter, the chaff hive was worked out.

and perhaps I would better own up that I was and beg his pardon, for he certainly has been quite successful.

For the benefit of those who did not have Vol. III, I will say that, in obedience to friend Townley's *commands*, after turning the frames around as mentioned, I covered them with a common grain bag, cut up, expressly to have every thing just as he said, and then poured in and packed all around the bees about 5 bushels of oat chaff. Of course, I made a passage to the entrance, by laying a shingle over a couple of $\frac{1}{2}$ inch sticks. To get at the truth of this matter, I am going to waste some time and—chaff. In fact, I have already taken one of the weak colonies that was likely to die, stood the L. frames on end, slipped a grain bag over all, put on an upper story, and filled both with chaff. They haven't got "hot" yet, but perhaps it needs more than a $\frac{1}{2}$ pint of bees for such an experiment. The swarm I have been talking about is the one that came from the suspended hive, July 24th, last year, and as I tried again to get them to fill the Quinby boxes, and they would not, they had every frame full of stores. I let them have it all, thinking I would try for once the consequences of too much food, if such a thing is possible.

I am now going to have for my next hobby, hives crammed full of stores and no tinkering during cool, or cold weather; no dividing until natural swarming commences, and if honey is the object, perhaps no dividing or swarming at all, if it can be avoided. No extracting until the combs below are filled to their utmost, and no extracting under any circumstances that may render it necessary to feed the same back again. Of all the blunders in bee culture I think there are few greater than fussing to get the honey out of the combs where it is nicely sealed up, and then fussing, at still greater lengths, to get it back into the same combs and sealed up in the same way, *if we can*. "And give up feeding?" At present I *would* give up feeding, at least where one has as much to do as I have. Why, just think of it! the best colony in our apiary has not had one minute's time expended on it for the past six months. At that rate, one person could take charge of 1000 hives until the time for surplus honey came, and should there be no surplus honey he might do it the year round, for all that would then be required would be to see that each one had a good queen, and the bees would do the rest. At the rate at which good colonies of bees sell, he could do

a thriving business selling them, if he didn't get an ounce of honey, and should a great yield of honey come, he ought to be able to hire help at a price that would pay for taking care of it, if he were not burdened with too many "new inventions." Now all these bright visions could be realized without trouble, if every colony as well supplied as was the one from which we are taking this text would only thrive in the same way.

The 20-frame hive wintered beautifully winter before last, because it contained two good colonies, but during the past winter, a fair colony went down to a pint, and the rest of our apiary went down in the same way more or less, during the month of April, or after they commenced to raise brood briskly. Is it possible that this spring dwindling has all been caused by allowing the juvenile bees to get sore throats, etc., on account of the brisk draft that our modern hives allow, when they are just the age to want to be tucked up? Keeping them warm with a tight board box has been no better; a tight board box would be small comfort to one of us on a frosty night, but plenty of warm, *porous* bed clothing would enable even an infant to keep comfortable. Corn fodder and straw put around hives and over them may keep the wind off, but they assuredly can not confine the animal heat in any such manner as the soft dry oat chaff that is only separated from the bees *on all sides* by a thin piece of cloth. Again, a packing of straw, or a straw mat over a strong colony of bees may be a very good thing, but can it amount to very much when there are cracks all around where the warm air can creep out, and when the sides are only cold, hard boards after all? How would you like to sleep in a bed made in that way? Would not the children begin to dwindle out in just about the way the bees do? Another thing; we don't cover our children with a board, or an oil cloth, or paper, or canvas, but we have wool and flannel; as the bees seem peculiarly sensitive to accumulations of dampness, I am inclined to think that even these would get damp and moldy. In fact, I have had some such experience, but the soft chaff, I think, is going to fully meet the requirements. Is it not possible that our fathers knew what was best when they decided on the old straw hive? Several weak colonies have starved because it was too cool for them to crawl up to a feeder containing syrup, while this Q. hive has bees all day and all night, walking around on the bare ground in front of the entrance which is

kept warm by this blast of warm air that is constantly passing out of one of the entrances, while a stream of cold air goes in at the other.

Several years ago, we had a very weak nucleus in the fall, and as they were out of stores (they were in the American hive) we gave them one L. frame moderately filled with stores. To get this frame into the A. hive, we were obliged to stand it on end, and as this looked like rather a cold and "loose" arrangement, we packed some very fine, soft hay all around and over the top. As there was but the one hive, we did it well and carefully, and so closely was the hay or grass packed, not a bee found a chance to get out during the whole four months. Well, we supposed this frame of stores would last them only a month or so, and to determine when they would need more food we tapped on the hive occasionally (they were in the cellar), to see if they responded promptly. Well, they answered every time until the next April, and when they were put out they were all alive, and had nearly all of their frame of honey left. As this was our first experiment with in-door wintering, we were jubilant over it, and the next winter put all our colonies in the cellar—omitting the hay (of course, *that* could not be important, we then thought, and it may be a good place right here to apologize to those whom we have ridiculed for packing their bees and putting them in the cellar besides), and when they died with dysentery worse than ever before, it did not occur to us *then* that the hay had anything to do with the matter. If, after all these years, our unlucky nose has, at last, by accident, been turned in the right direction, we shall be very thankful.

May 18th.—As the bees were crowding out of the Q. hive to-day, I removed the chaff covering. The colony is a mammoth one for the season, and we found solid sheets of sealed brood in nearly every one of the 8, large Q. frames. The chaff protected them so well, that they seem to have been entirely free from the dwindling that has affected nearly every other colony; of course, the abundance of bees and stores in the fall, as well as the chaff, had much to do with it. To get at the real virtues of this chaff idea, I am making some experiments now, which, I hope, will tell me before another winter, just how much to expect from it. If I can keep the whole interior of the hive warm, even in June, during cold storms and cool nights, by some such porous covering, I

think it will be quite an item; perhaps it, like many other things, when well tested, may turn out to be an accidental success after all; but I wish to *know* just what it does.

Last year, we did not clip our queens' wings, but with the prospect now before us (several colonies are strong enough to swarm) we have concluded to have all clipped.

Now in regard to closed end frames; I found the queens, moved the division boards, and had the hives all closed up, where there were suspended frames, in an amount of time that seemed insignificant compared to that required to perform the same operations with a closed end Q. frame; and the statement made by a few, that such hives can be handled as rapidly as the suspended frames, seems to me positively *awful*. With a small colony, and a new hive, either closed top or closed end frames may be handled very well; but with an old hive so full of bees that they cover the end bars of the frames so as to prevent your seeing the wood at all, and frames so heavy as to make your back ache, while you stoop in the hot sun and look first at one end, and then at the other, to see if you are killing bees, and those hybrids, too,—well, if you think we don't know how, try one such hive yourself, or visit some one who *knows* how, if such there be. A careless person might not be aware that he killed bees at all, and some do not seem to care, but to me, the sight of the quivering form of a crushed and mangled little fellow when he is innocently standing in the threshold of his own door or peering out at the blue sky, while the closed ends are being brought up into place, is enough to spoil the pleasure of bee-keeping.

June 14th.—To open up the season's campaign, the Quinby hive sent out a rousing swarm to-day. Now, even after this swarm was hived and had sent to the field more workers than any two stocks in the apiary, the old hive kept on at work, with almost the same force as before, for they had been for a couple of days rather inclined to loaf on the front of the hive. Before swarming, they stored 50 lbs., perhaps, in boxes, and there are bees enough left to keep the work going right along. What do you suppose an apiary of 100 stocks like this one would amount to? and this is the Quinby hive that we have tried 4 seasons, and heretofore, unsuccessfully. Although our esteemed friend who invented it is departed, his works bid

fair to keep him in kind remembrance many days.

June 27th.—Hurrah for chaff! The Quinby hive has sent out a large second swarm.

Sept. 5th.—Our Quinby hive (packed with chaff) has given us four swarms, and all are now good strong colonies. If the chaff packing should work as well next winter, why may not the 5 increase to 25? This would be 25 from one, in two seasons. But this is not all; the first swarm stored full 50 lbs. in empty combs, and since these were removed has given us about 25 lbs. in sections. The second swarm has made about 25 lbs. of comb honey, and the third about 10; all four, as well as the old colony, have their hives crammed with stores, and the original stock has stored about 100 lbs. of honey in the Quinby boxes. Think of it! Five colonies amply provisioned for winter, and 185 lbs. comb honey, from one in the spring!—*End of extract.*

From the above, you can see what turned my mind so vehemently in favor of chaff. The same winter, in which I packed the Q. hive, as given above, I wintered the bees in the house apiary, with only a single thickness of cloth over the frames. The result was, they dwindled the worst of any bees I ever tried to winter, and I lost, if I am correct, every colony but one or two. The winter after, I protected them with heavy chaff cushions, and they all wintered nicely; not as well, quite, as the Q. hive, it is true, but they were not as perfectly protected on all sides. Since it is so much labor to handle the Q. frames (as I have before mentioned), the next winter, I tried a similar arrangement with the L. frames enveloped in a large case, with chaff, or cushions, on all sides. All colonies so packed came out all right. My neighbors made similar experiments, and they, too, as well as friend Townley, reported the same, with scarcely an exception. From these experiments, I worked out the chaff hive which I have here described, and, after a three years' test, taking all things into consideration, I consider it the simplest and safest means by which bees can be wintered. The second year, our bees were all packed in chaff, and the result is given briefly in the following editorial, in the May No. of *GLEANINGS*, 1877:

April 29, '77.—We have sold \$250.00 worth of bees out of the 100 colonies reported last month, and have 75 good colonies left. Is not that a little better than the reports we have been in the habit of making for the month of April? An income from bees, in the spring, is certainly quite a pleasant thing to have. Hurrah for the chaff cushions! and many thanks to friend Townley.

The winter of 1877-78 was very mild, and bees wintered well in chaff hives, and in hives of every other kind, so that our bee-keepers, myself among the number, doubtless got a little careless, and in undertaking to winter small colonies in the same way in the winter of 1878-79, disastrous losses followed. Strong colonies in chaff hives came out, as a general thing, as strong as they had in the preceding winters, but bees in common hives, and rather weak colonies in chaff hives, fared badly. The general testimony from bee-keepers all over our land is so strongly in favor of the chaff hives, that there can be no doubt about their coming into very general use for a winter hive. The Simplificities, from their lightness and convenience in handling, will always be in great demand for summer work. It is but a moment's work to lift the combs from one into the other.

WINTERING IN CELLARS OR SPECIAL REPOSITORIES.

A few years ago, cellars and special repositories became all at once very popular, and bee-keepers all over our land, especially in the northern localities, invested much labor and money in constructing good, frost proof cellars, or sawdust packed buildings above ground. In 1868, I put up such a building, and packed the walls with 8 inches of sawdust, and also put sawdust between the floors and over head, and wintered 48 colonies in it without losing a single one. A neighboring bee-keeper who used one similarly constructed had wintered in his for nearly a dozen years, and, at that time, had never lost a colony in it. These results seemed pretty nearly conclusive; but a few years later, when the spring dwindling, as it has been called, made its appearance, my neighbor and I both made the discovery, that bees taken out in March, in fair order, would often, in spite of us, become reduced, before the end of April, to a mere handful, and then perish outright, or leave their hives and swarm out as I have mentioned under the head of *ABSCONDING SWARMS*; while at the same time, good, strong colonies left out-doors without any especial care, would often be full of bees and ready to swarm. I do not mean to say that such was generally the case, but there were always more or less in the neighborhood that would winter finely without care, while many so carefully housed would turn out disastrously. A neighbor who had devoted almost his whole time to his bees would be obliged, in spite of his well made bee house

to buy black bees in the spring to keep his Italians alive, and the strong colonies of black bees were invariably wintered almost without loss, in an open shed, in cheap, unpainted, box hives. Even the York state bee-keepers with their splendid cellars built especially for their bees, if I am correct, often used to go off into the country and buy black bees, in the same way, to get another start in the spring. It is so difficult to get many of them to report their *losses*, that I am unable to say whether they do any better of late years or not. I presume they do, for I should be very sorry to think we were making no progress in this one, great drawback to bee culture.

The bee houses answered very well the purpose of protecting the bees from the effects of frost during ordinary winters, but when we happened to have a very severe spell of several days' duration, the walls would collect ice and dampness, in the way I have explained in a former part of this article, and when the weather moderated, the melting of this ice made the room damp and unwholesome, in spite of the ventilating tubes or anything else that could well be arranged in such a building. If the weather came off very warm, as it frequently does even in midwinter, in our locality, the bees would very naturally want to get out, and then ensues a disturbance that is very likely to result in trouble, unless the weather speedily changes. The houses may answer well for one or two winters, or even more, but with the changeable weather we have here, I am forced to consider them more trouble than profit, taking them for a series of years together. To illustrate what we have to contend with, I will mention that in the month of Jan., 1878, we had such a spell of warm weather that dandelions were found in blossom, and the bees raised brood and grew strong almost all the winter through. Well, the winter after, during almost all the month of Jan., the thermometer stood from 10° to 20° below zero, and the spring being late and cold, the spring dwindling had a "run," almost unknown before. One-half to perhaps three-fourths of all the bees in the Northern States perished. Houses and cellars were a splendid investment for such a winter, while they might have been a perfect nuisance the winter before.

ADVANTAGES OF A CELLAR OVER A ROOM ABOVE GROUND.

Now, a good cellar has one very obvious advantage over any building made above

ground, for the earth at the sides and under the floor will shut out frost in those directions, and a good building over head will afford protection above. It is not, in fact, very difficult to make a cellar without windows perfectly frost proof, and we want no windows in the apartment where the bees are kept, for the darker it can be made the better. Besides keeping the frost out, a good cellar is comparatively cool, even in the summer time, a condition that is hard to be secured in a room above ground. What then is the objection to a cellar? The principal one, in our clay soil here in Medina, is that it is almost of a necessity damp. A good, clean, dry, frost-proof cellar, in a sandy soil, is perhaps as good a place for wintering bees as can well be arranged. If it can be in a sandy side hill, so that the bottom of the cellar is on a level with the apiary, it seems as if almost nothing more could be asked. I should ask one thing more, however, and that is, that the hives be arranged permanently in this cellar, and the bees be allowed to go out at their pleasure, as they do in the house apiary. There are two difficulties in the way of doing this: first, it would be difficult to fix an entrance not too long, and that would not admit frost; second, the bees would lack the benefit of the warmth of the sun during the spring months. I do not see, at present, how we can get anything much better than the chaff hives, and the house apiary.⁹⁵

HOW TO GET RID OF DAMPNES, AND SECURE PERFECT VENTILATION IN CELLARS.

It was long ago noticed by many, that bees wintered in cellars directly under the kitchen stove came out in fine condition, while others where there was no stove near the bees wintered badly. This seemed to show conclusively the benefit of artificial heat, for warming and drying the atmosphere. If you will recall what has been said in regard to cold and warm currents of air, you will see that to change the air thoroughly in any apartment, you must get up a circulation, by heating a portion of the air, or by other means. Putting a stove in a room or cellar answers nicely for drying and thoroughly ventilating the apartment at one and the same time. As this would be likely to cause a disturbance among the bees, it is much better, to run a pipe, such as a stove pipe, into or through the room. A very common plan is to attach a pipe by an elbow to the pipe coming from the cooking stove. Carry this down into your bee

cellar to within 6 inches of the floor. The draft from the stove will "pull" the air up, even the damp air from the floor, and fresh air will find its way in through the crevices, to take its place. If you wish to be sure that a current of air is constantly going up this pipe, throw a burning rag or paper on the floor, and the smoke will show you how the air rushes up the pipe.

I believe the large bee-keepers of York State, generally, have decided on in-door wintering, and Mr. L. C. Root, in his *Quinby's Bee-Keeping*, just out (May, 1879), gives us some very valuable ideas on the matter. Recognizing the points I have just mentioned, they have, at considerable expense, prepared underground rooms, to be dried and heated by suitably arranged furnaces. They have entirely discarded buildings built above ground. Mr. Root particularly enjoins quietness, and to this end, advises that no one go into the bee room during the winter. Also that the hives be supported from the floor, or ground, and not placed on shelves or benches, as is so commonly done. This would avoid disturbing the bees in the other hives, when you are handling any one of them. The clamps or cellars are, if possible, built in a side hill, and the roof overhead is covered by at least a foot of dry earth, which is kept dry by a good shingle roof over this. The bees are to be put in these rooms during dry weather in the fall, and, if I am correct, they are not to be taken out until pollen and honey can be obtained in the spring.

I hardly need to say that a cellar or frost proof repository should have double doors, and if there be windows, they should be fixed in a manner that will be equivalent to making them double, being sure that no portion of the walls ever shows a bit of frost to melt, and thus produce dampness. A cellar within a cellar would be the thing, and if it can be so perfectly protected from dampness that the dust on the floor will remain dry all winter long, it is about as nearly perfect as it can well be, if perfectly dark, and well ventilated; that is, so far as getting the bees through the *winter* months is concerned. If I am correct, our greatest losses have been in the spring months, after the bees have been removed from their winter quarters. I shall have more to say on this, a little further along.

PREPARING STOCKS FOR THEIR WINTER QUARTERS.

We used to think, where bees were housed from Nov. until April, that we need only

carry in the body of the hive, omitting cover and bottom boards, and in short everything but just the combs necessary to carry the bees and their stores, with enough of the hive to move them handily. Now, although I have wintered bees finely, having nothing over the frames at all while in the cellar or bee house, I would, taking all results into consideration, pack them in chaff to be carried into the cellar, much the same as I would to winter them on their summer stands. Then, when carried out in the spring, they are proof against cold winds and cold nights, which almost always ensue. For the same reason, I would advise the chaff covering even in the southern states, that the bees might be spared the chilling spells that are so much of a hindrance to brood rearing, even though the weather is not down to a freezing point. Bees with warm walls all about them are in a much better condition to go on with brood rearing, than where the cluster touches cold, damp boards, and where cracks and crevices permit the warm air of the hive to pass out as fast as the bees can generate it. With a well made chaff hive and a good colony of bees, I can keep brood rearing going on by the use of the flour candy, right in the depth of winter, with the hive standing out-doors at that. In 1877, I hived a fourth swarm, late in the season, in a chaff hive, and, as an experiment, built them up during the winter, with a frame filled with the flour candy, until they were so strong in the spring that a customer chose them in preference to any other hive in the apiary, and paid me \$15.00 cash for them, which gave me an excellent profit on all the time, sugar, etc., that was invested in the experiment. I would bundle them up in chaff or chaff cushions, no matter where they are to be wintered. The experiments I first made in this direction with the house apiary also illustrate this subject.

TIME OF PUTTING THE BEES INTO THE CELLAR.

If they are packed and put away before the first frost comes, all the better; and please be sure to put them in-doors during some dry day, that the hives and combs may be entirely free from dampness. You will have warm days after the first frost, I am well aware, and unless your cellar is as dark as the deepest midnight, and cool enough to prevent the bees from getting uneasy, you will have trouble about keeping them in their hives. This is one great reason why I object to cellar wintering.⁹⁶ Some bee-keep-

ers advise taking them out for a fly during the winter, when we have a warm spell; others object to moving them at all, and perhaps both are right. Sometimes, carrying them out does good, and, at other times, it seems to do harm. If you have them in chaff hives or a house apiary, they can go out whenever they please, and this plan pleases me much better. I do not like to be confined myself, and do not like to be obliged to confine any of God's creatures, when it can be avoided. I have sometimes had bees remain quiet and contented in the bee house, and in the cellar, four months, without trouble, and, at other seasons, they would not be quiet one month. At present, I do not know why bees winter well at one time, and at another, do not, when all the circumstances, so far as we can see, are the same.⁹⁷

SHALL BEES BE CONFINED TO THEIR HIVES WHEN PUT IN-DOORS.

If the bees are fastened in their hives with wire cloth, in such a way that the dead ones, in falling down, will not close and clog the entrance, I do not know that it makes any difference whether they are fastened in or not.⁹⁸ In the one case, they will die against the wire cloth, and, in the other, they will get out on the floor and die. It is so untidy and disagreeable to have bees around on the floor, on the shelves, and all over the room, that I think I should fasten them in; I have done it two seasons, and did not consider the quantity found dead in the hives greater than we usually find on the floors. It has been recommended that an extra space be given below the frames, for the dead bees, that they may not clog up the entrance. With the Simplicity hives, this can be readily furnished by turning the bottom board hollowing side up, putting wire cloth over the openings at both the front and back end, and fastening the bottom board in place.

BEST TEMPERATURE FOR A CELLAR OR BEE HOUSE.

The general agreement has been on about 40°; but some of the York State bee-keepers claim they can succeed by keeping them as warm as 50°. My experiments seem to indicate that such a temperature, in confinement, would induce dysentery; but a systematic ventilation in connection with this temperature may answer better than the 40°.

REMOVING THE BEES FROM THE CELLAR.

If they do not get too restless, I would allow them to remain until the soft maples, or willow and alder, begin to furnish pollen.

Put them out very early, in the morning of a warm pleasant day, if you can tell what morning will develop into a pleasant day. Set each hive out so quietly that none of the rest will be disturbed, if you can.⁹⁹ I would a little prefer that each stock be placed on its usual summer stand, if it be practicable, but, if not, it may make but little difference. Colonies often get badly mixed when first carried out, and queens are sometimes lost. Giving each one its old stand will do much to avoid this. If you doubt that the bees remember their old location, just set a single hive on a new stand, and see where the bees will go, when suddenly disturbed and allowed to fly.

After they are all out, and nicely fixed as they were the fall before, keep a close watch that the weak ones do not swarm out, as they are quite prone to do, after their long confinement. I do not know but I may disgust you with indoor wintering, by the many difficulties I have been mentioning; I want you to know what you have to contend with, even though I do discourage you.

ADVANTAGES OF CELLAR WINTERING.

L. C. Root estimates that bees wintered in-doors probably save as much as 5 lbs. of honey per colony. This would be quite an item, in an apiary of 100 hives. In contrast with the method of wintering out-doors without protection, I think he may be right; but, with a properly prepared chaff hive, I think there will be little, if any, more honey consumed, unless it is used in rearing brood which will add to the strength of the colony. A colony may be so wintered as to consume scarcely any stores, but it may take them all the fore part of the honey season to recover strength enough to be of any value.¹⁰⁰

NUMBER OF COLONIES TO BE PUT INTO ONE ROOM.

Unless you have as many as 40 or 50, I would not think of wintering them in-doors; for a few colonies would not be able to keep up the temperature of the room, and it would be liable to get very cold. Many failures have been reported from trying to winter a dozen or more in a small room.¹⁰¹

SUMMING UP THE MATTER OF WINTERING.

Taking all things into consideration, my advice to the A B C class, and to all others who have not large apiaries and large experience, is to winter in chaff packed hives, in the open air, on their summer stands. If it were as pleasant and convenient to handle bees in the house apiary as in the open air, I should say, have a house apiary.

SPRING DWINDLING.

I do not know whether to style this a disease, or a condition of things that comes about naturally during cold and backward springs. I should incline to the latter, were not its ravages so uncertain; that is, it seems to affect a part of an apiary and not another part; and, at times, it will go all through one apiary, while another, a few miles away, will be entirely free from it. It is very certain that it afflicts weak colonies, as a general thing, more than strong ones, but there are exceptions even to this. It is much worse after a long, hard winter, and it disappears always at the approach of settled warm weather and new honey. Although it does not generally seem to affect stocks before March, I have seen them affected by it from Feb. until June. I have even known colonies to be listless and lifeless from its effects, until others in the apiary were sending out rousing swarms. Strong colonies that are raising brood vigorously seldom *seem* affected by it, but I suspect they *are* affected more or less by it, or by the condition of things, but have sufficient vigor and strength—animal heat, if you please—to pull through until there is plenty of warm weather, new pollen, and new honey.

It made us but little, if any, trouble in our apiary, during the spring of 1878, but we had such a siege of it in 1879 that an extract from GLEANINGS of that year, for May, will make a very good description of it.

SPRING DWINDLING.

A Report from the Battle Field, by an "Eye Witness."

To-day is the 15th of April, and scarcely a bit of pollen has been gathered. The buds of the soft maple are open, but for some reason which I cannot give not a bee is to be seen hovering near them; the slippery elm is also in bloom, but, strange to say, not a bee hums about it either. The weather has not been very warm, and there is a cool north wind which may account in part for the seeming indifference of the bees to blossoms. Last month, I reported 85 colonies left. Since then, one after another, they have been dwindling down, in a wonderfully short space of time, and stocks that were called fair, having brood on several combs a week ago, are now found with only a handful of bees, the brood dead by exposure, the unsealed larvæ starving and drying up in the cells, and a general air of discouragement all about the hives. Some colonies

bring in a little pollen now and then, but the great part of them seem to have suspended work, and the bees are loafing idly about on the combs. Usually, we find a row of cells of unsealed honey around the young brood, but now the heavy combs of sealed stores remain untouched, and not a cell of honey is placed close to the brood for immediate use, and every bee seems to have stopped work. When we open hives, there is no need of a smoker, for the greater part of the bees seem too listless to care to show fight. Some cases seem to indicate that the black bees are less affected than the Italians; but, again, we find heavy stocks of blacks, in box hives, bought of some of our neighbors, all at once reduced to a handful, the queen gone, and the whole establishment an easy prey to robbers, if the robbers had energy enough to appropriate it. The dwindling is not in my apiary alone, but is also lessening the stocks of the farmers and other bee keepers in our vicinity, and, in fact, all over our land. Not that every body has lost thus, for many whole apiaries seem to have wintered as well as they ever did, but the losses seem to extend so widely, that it is almost impossible to ascribe it to any special locality, or kind of stores. The chaff hives, it is true, were all right when the others were dying off at a rapid rate, but within the past week they, too, have begun to follow the rest, at a rate that is alarming.

The house apiary, somewhat to my astonishment, seems almost unaffected, only that they are making very slow progress in brood rearing, and a very few stocks show signs of the universal dwindling. Even the flour candy seems to have lost its potency to start brood rearing. I have had experience in this same line before, and it seems to me that nothing but new honey and new pollen can revive the drooping courage of our little pets. I need hardly add that grape sugar has nothing to do with it, for apiaries where it has never been used are just as much affected. The bees have died close up to combs of sealed clover honey. No symptoms of dysentery are to be seen. Meal has been given them in fine weather, but their zeal for it has been nothing like what it is usually. There are now 55 "hives with bees in them," in our apiary. Perhaps a dozen of these have queen-cells, instead of queens. Four whole colonies, 9 nuclei, and 35 queens (48 in all) have been sold. I am thus particular in giving these details, because I think all who embark in bee culture should have a fair view of the obstacles they may have to

contend with. We went into winter quarters with 166 colonies.

It is not often that I disobey orders, but the following describes so vividly the condition of my bees, except those in the house apiary, that I have concluded to run the risk, and give it. It may make some poor fellow feel better, friend Bray, for you know that misery loves company.

Well, I went into winter with about 130 colonies of bees. To-day I think I can house all I have left in a $\frac{1}{2}$ bushel measure—yes, I believe I could put them in a peck basket. Don't publish this. It would cost me about \$500. to replace them. What's the matter? However, I shall not give up. Can you offer me any consolation? I hope you had better luck than I have had.

J. B. BRAY.

Lynnville, Tenn., Mar. 28, 1879.

April 25th.—We have now had nearly a week of beautiful weather, and the troubles are all over. The bees are at work on the maples, and under the influence of new honey and pollen, everything is promising. The weak colonies have still quite a propensity to swarm out, and for some strange reason, our queens most unexpectedly turn up missing every day or two. This trouble seems mostly confined to the black queens in hives I have purchased, so we cannot well ascribe it to artificial ways of managing. The farmers in the country round about us have lost most heavily. Our neighbor Shaw, of Chatham, strange to tell, has come through again this winter, without the loss of a single colony. His hives are not chaff packed, but are double, with a dead air space between the walls. Those of our neighbors who reared queens for sale last season have generally lost badly. Our engraver, who had quite a fine little apiary in

the fall, has now but two colonies left. His imported queen went with the rest, and it was perhaps his sad experience that prompted our cartoon for this month which I may as well give you right here.

End of extract.

It may be well to state that the bees in 1879 were not as well protected as in the former year, but the fact that colonies in the chaff hives were eventually affected, proves that chaff, with all our pains, is not a positive preventive.

CURE FOR SPRING DWINDLING.

As I have said before, I know of no positive cure except warm weather, and this always does away with it entirely; were this not the case, I should hardly be willing to class this great drawback to successful bee culture, under the head of wintering. The question now arises, can we not, by the use of artificial heat, bring about such a state of affairs as is produced by warm weather? In other words, can we not, by going to the necessary expense and trouble, save our bees and queens, even though seasonable weather does not come? Many experiments have been made in the matter, and some of them, apparently, have succeeded; but, on the other hand, many of them have signally failed. I have started healthy brood rearing in every month in the year, by means of artificial heat, but to take a whole apiary that is running down, in the month of April, and build it up, prevent the colonies from swarming out, and the queens from deserting and dying, is something I have never succeeded in doing.

A singular part of the whole matter is that our friends in the South should suffer in the same way, and even worse than we in the North, as the letter I have given in the extract above indicates. Similar cases have been reported almost all over the South, although it is a more unusual thing there, for bees to die with plenty of stores in the hives. There are considerable apiaries in Medina Co., which, until within the past two years, have scarcely known a case of this spring dwindling, but which have lately been badly affected. Two of the owners have excellent cellars, and, heretofore, have rather ridiculed the idea that spring dwindling was due to other causes than careless management. Therefore, my friends, I am sorry to say that, though you have hitherto never lost a colony in your life, you must not be astonished or disappointed should you, some spring, see all your colonies go down to handfuls, in spite of all you can do, and per-



AN EXPERIENCE THAT "BLESSED BEES" DIDN'T TELL OF.

haps perish outright. If I am mistaken, I shall be very glad to know it, but I think it will be safest, to base our calculations on the assumption, that bee culture, in some respects, is a hazardous business, even with the most thorough and careful.

WHAT TO DO WHEN YOUR BEES GET
"SPRING DWINDLING."

Look them over every other day, if necessary, and close up the division boards, taking out all combs they cannot cover. As soon as a colony gets so weak that it cannot cover two combs, unite it with some other weak one; also, whenever you find colonies queenless, unite them with others. If you have the real dwindling, you will find queen cells started and queens missing, at almost every round you take among the hives. This is because the colonies have become disheartened and demoralized, and the only thing that will prevent this demoralization is to double them up, until there are numbers enough to repel the frost, and make them feel that there is some use in trying to hold out. It may be that these same colonies that you double up and make strong one day, will need the same thing done again, within the next 3 days, but there is no help for it. Keep the brood together so as to have it protected as much as possible, and keep reducing your colonies until they stop losing bees with such rapidity. The question may be asked, what becomes of the bees? I believe, generally, they fly out of the hives, and never get back again. During cool sunny days, they may be seen on the fences and sidewalks, on the grass and like places, often laden with pollen, showing clearly that they are trying to make a live of it, and doing the best they can.¹⁰² I have sometimes thought they became so chilled in their meager clusters at home, that they had not sufficient vigor to withstand the chilly spring winds as a bee from a powerful and prosperous colony would. As the Italians are more eager for stores than the common bees, it may be that this is one reason why they are often said to be more liable to this dwindling than the common bees.

Now, in regard to a decreasing apiary, allow me to say, even if the bees do get demoralized, you must not. Fix up the hives and combs where the bees have died. Brush out the dead bees and bury them, that inquisitive visitors may not make a great fuss on seeing heaps of dead bees, and while you make a retreat, do every thing in good order. Make the apiary neat and tidy, just as you would if every hive was boiling over with

bees. Do not leave any filled combs exposed to robbers, but as fast as they are taken from the bees, either shut them up in bee tight hives, or carry them into your bee house. Your neighbor may have hives strong with bees that will like no better fun than to clean your hives out, and after they get once to going, you may find they will clean out your hives that have bees in them too. During the past few weeks, I have had more complaints of robbing in connection with this spring dwindling, than ever before, perhaps, in the spring. Some of the friends seem inclined to lay the whole trouble to the vicious bees belonging to their neighbors, or coming from the woods.

During the doubling up process mentioned above, many queens will be thrown out, and if the season is far enough advanced, they may be sold to those about you who have colonies strong enough to divide. As a proof that these queens are just as good as any, just put them into a strong colony and you will see them go to work just as well as they did during the summer previous.

Well, suppose the bees all die; what then? Why, you must do the best you can, and if none are left, go out among those about you who are more fortunate, and buy more. By paying a dollar a lb. for bees, as I have done for the past month, or by buying hives and all, as cheap as you can, with your stock of hives and combs, you may build them up at a rate that may astonish not only those about you, but even yourself as well. In order to save your queens, it may be well to purchase before your bees are quite all gone. You will find that bees from another yard will take hold and go to work just as well as they ever did. Even this 10th day of June, I have noticed colonies that seem not to have recovered entirely from the siege they have just passed through, while stocks right by their side, no heavier, but which were purchased 10 miles away, perhaps, seem to rear brood and build up equal to any thing I ever saw.

WHAT TO DO WITH COMBS FROM HIVES
WHERE THE BEES HAVE DIED.

Put them safely out of the way of bees, either in tight hives, or in a bee proof room, and if you have not bees enough to cover them by the middle of June, or at such a time as you shall find moth worms at work among them, be sure that all the combs are spread at least two inches apart, as recommended in BEE MOTH. Now, whatever other precautions you take, you *must* look after these empty combs occasionally. They are

very valuable, and must not be allowed to be destroyed. A very good way to keep them is to put them in empty Simplicity hives, piled one over the other. This keeps them perfectly protected, and yet you can quickly look them all over as often as once a week at least, until they are used. But suppose they do get moldy, or full of worms, what then?

WHAT TO DO WITH COMBS THAT ARE
SOILED, MOLDY, AND FILLED
WITH DEAD BEES.

When I wrote the article on DYSENTERY, I forgot to mention what should be done with the combs after the bees had died. Many times, you will find the cells full of dead bees, and anyone who has tried it, will know what an endless task it is to try to pick them out. Well, do not try; but just take these combs and set them away, until you want empty combs to build up stocks, and then hang them one at a time, in the centre of a populous colony. After a few hours, just take a peep at your comb, and see how the bees do it. If it is at a season when honey is coming in, it will have undergone such a transformation, you can scarcely believe your eyes, when you come to take a look at it. I have put in combs that were full of dead bees, filthy from the effects of dysentery, and moldy besides, and found them in the afternoon of the same day clean, bright, and sweet, holes patched up, and partly filled with eggs, honey, and pollen. In one case I hunted the hive all over for my bad comb, and then came pretty near declaring somebody had taken it away; there was no comb there that could be identified as the bad one. Do not extract the honey, pick out the bees, or fuss to wash them off with water; just let the bees try their hand at it, and see. Do not give them too many bad combs at once, or they may get discouraged, and swarm out. Give them one, after a few hours, another, and you will very soon have them all right. How do they do it so quickly? Well, each bee takes a cell, and when he has his cell finished, they are all done. Suppose you had as many boys as there are hills of corn in the field. If all went to work, the field would soon be clean. Combs infested with moth webs, and even live worms, may be fixed up in a twinkling, in the same way. If you stand in front of the hive, you may have the satisfaction of seeing the worms led out by the nape of the neck; to do this, you want a strong vigorous colony of Italians. See BEE MOTH. A new swarm will

usually clean out a hive of bad combs, in the same way, but if too bad they may swarm out. Better take them in the way I have mentioned. To be sure it pays to save such combs.¹⁶³

THE LOSSES DURING THE WINTER OF
1880-'81.

It is now July, 1881, and the winter we have just passed through has been the most disastrous in the way of spring dwindling ever known. Probably three-fourths of all the bees in the Northern States were lost, and a great part of them were in pretty fair condition until April, when a very severe spell of winter, with a temperature below zero, was the occasion of the greater part of the losses. Bees that were in good warm and dry cellars during this siege fared better; but some very bad losses are reported, even with cellar wintering. While bees in the chaff hives suffered more than they ever have before, the testimony in favor of chaff hives over those unprotected has settled the matter of their superiority, beyond all question. At the same time, a great number of reports point strongly to the importance of more and better ventilation than we have been in the habit of giving. Hives where the section boxes were carelessly left on all winter have, in many cases, come through in good condition, while those closely packed with chaff cushions above have died. In our own apiary, we started into winter with about 140 colonies, and saved less than a dozen. It is proper to say, however, that few or none of these were really strong, first-class colonies. The young bees were shaken from the combs in the fall, and used to fill orders; and our trade in queens also kept many of the colonies queenless when they should have been rearing brood to stand the winter.

The following is from the pen of Mr. Langstroth, in regard to the loss in my apiary, as given in *Gleanings* for July, 1881:—

ON THE PROBABLE CAUSES OF THE LOSS OF OUR BEES
LAST WINTER.

Your heavy losses in bees affect me painfully. While I admire your cheerful spirit under such severe reverses, I know that the failure to winter your bees is much harder to bear than the mere pecuniary loss. I speak from a vivid recollection of similar experiences. Before I discerned what precautions were necessary for wintering bees successfully in movable-frame hives, I more than once found myself in the spring in a plight almost as bad as your own. I can fully indorse your explanation of some of the reasons why your reverses have been so much greater than those of some large bee-keepers in your neighborhood. I often met with great losses when my apiary was managed chiefly for the sale of Italian queens. At the close of a poor honey

season, my apiary often had many weak colonies. The temptation to winter every such stock which had a good queen was very great, as the demand at high prices for such queens in the spring was usually greater than could be met. It was only the fact that my location was a poor one for honey, and that I could get large prices for nearly all the queens that I could raise, that at all justified my course. If in addition to the queen business, the selling of bees quite late in the season by the pound had been practiced, the condition of my apiary after an unusually cold winter and late spring would probably have been very similar to that of your own. I give some comments on your replies to questions which I sent to you.*

1. "Did you spread the combs further apart?"

"I did not. Although recommended, so far as I know it has been mostly abandoned."

Mr. Harrison, of Buffalo, first called attention to the importance of keeping the combs in which the bees cluster for winter some $\frac{1}{2}$ of an inch further apart than the natural breeding distance. In the old box hives there are usually spaces in which bees can cluster in much larger numbers than in movable frames properly spaced for the working season. In the very cold winter of 1872-'3, I wintered in the open air in hives only $\frac{1}{2}$ thick, until February,† a number of stocks which were estimated not to have over two quarts of bees per hive. All the bees of a hive were placed between two combs full of honey, which were kept nearly three inches apart, and they formed a single cluster, shaped like a ball. If the combs of these stocks had been left in their summer position, no amount of chaff used in any fashion could have saved them. Mr. J. S. Hill, of Mount Healthy, O., who wintered last season 112 stocks without losing one, and who has wintered on an average 80 stocks a year since 1868, without the loss of one, spreads the combs.

2. "Did you make winter passages in the combs?"

"Perhaps half of the combs have winter passages. I have never been satisfied it made any material difference."

In this you differ from those who have had the best success in wintering bees. Mr. Hill, for instance, never neglects this point, and I am satisfied that the power of passing from comb to comb through the heart of the warm cluster, besides saving the lives of many bees, greatly encourages early breeding. In the old box hive the holes around the cross-sticks for the support of the combs give the best of winter passages.

3. "Did you place burlap or any other non-conductor of moisture over the frames?"

"We used burlap, wood mats, and crumpled sheets, but saw no difference in favor of either."

Whatever the material used for confining the bees below, it should, as a matter of course, permit the ready escape of superfluous moisture. With weak stocks in very cold winters, this is a point of great importance.

4. "Did you give the bees a good space above the frames for clustering in?"

"A part of them, perhaps nearly one-half, had an empty frame, or a frame of stores placed over the cluster. Our Holy-Land bees went into this upper chamber and starved, having plenty of stores below."

* Friend L. wrote, before writing this article, asking five questions. I answered briefly, and his comments are on these questions.—Ed.

† Advised by the Signal Service that a cold wave more severe than any previous one was coming, the bees were removed into a cellar.

Reference to the back volumes of *A. B. J.* show that Bickford's quilt (afterward improved by you) is credited by him to the successful experiments which he witnessed in my apiary. I discarded the honey-board in wintering, using, instead, woolen rags, old carpets, etc., through which all superfluous moisture could pass, while sufficient animal heat was retained, explaining at length that the principle was the same as using suitable bed covering to keep ourselves dry and warm in cold weather. I have always regarded the elucidation and application of this principle as a great advance in practical bee-keeping. The letters of Huber, published only a few years ago, show how much his bees suffered from dampness; and before I so fully expounded my ideas in the *London Journal of Horticulture*, our English friends found that they could not use wooden boxes with any satisfaction. My plans, as seen by Mr. Bickford, and very fully described in *A. B. J.*, not only gave this free escape of moisture without too much loss of heat, but especially provided an ample warm space for the bees above the frames, so that the cluster could contract or expand at will. This saved the lives of many bees which, in very cold weather, even with the best winter passages, often failed to regain the central cluster, and died because they could not keep up the necessary heat.

I believe that, even in such a winter as the past one, that with winter passages, combs properly spread apart, and a warm clustering space for the aforesaid purposes, bees could be better wintered in the open air in hives $\frac{1}{2}$ of an inch thick, than with any amount of chaff above, around, or below them, where these precautions are ignored; for in sunny weather such thin hives will warm up so as to dry out and allow the bees to reach their stores, while the chaff hives may remain cold and damp as a cellar. I will send you, in due season, an unpatented device used by Mr. Hill, for securing a warm nest above the clustered bees, which answers the end better than any one I have yet seen. Is there a man in all our northern country who can claim equal success with Mr. Hill in wintering bees? It hardly need be said that he is a pattern of skill, energy, and promptness. He has made his bees pay in a region where I think it is ordinarily more difficult to secure one pound of surplus than two in the more favored northern locations.

5. "Did you feed your bees for winter with a mixture of grape and cane sugar?"

"Only a part of them, as I stated formerly."

I think your losses were owing in part to your use of grape sugar, even although your candy contained but one part of it to three of best granulated cane sugar. It is not at all necessary that grape sugar should contain any impurities to make it a very hazardous food in such a winter and spring as we have just had. From its low sweetening power as compared with honey or cane sugar, your bees which used it were forced to eat more than they otherwise would have done, and thus to suffer from a greater accumulation of feces. You say, "Had our usual April weather come on, we should probably have saved about 50 colonies that we lost." Is it not highly probable that, with the weather just as it was, you might have saved many of those colonies, if they had not been forced to succumb under the excess of feces produced by the undigested starch which so largely enters into the composition of grape sugar?

During the winter of 1881-'82 we prepared

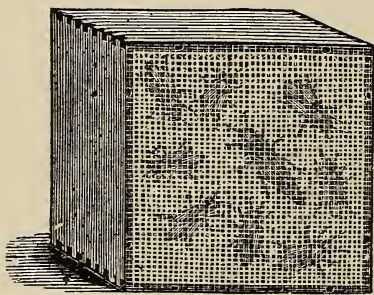
about 200 colonies as Mr. L. directs, using the Hill device (see p. 274), and they came through almost without loss, but the winter was a much milder one than the preceding.

A "CRUMB OF COMFORT" FOR THOSE WHO HAVE LOST IN WINTERING.

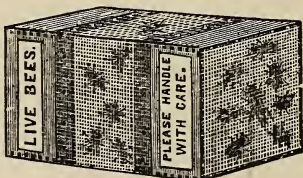
While the great losses have worked disaster to many, a great good has resulted in obliging us to improve our methods of shipping bees as well as queens to those who have quantities of empty hives and empty combs; and the trade now in bees in cages containing 1 lb. each and a queen, is almost a national industry. The bees are sent in wire cages made of bands of wire cloth, and our usual 1-lb. section boxes. In each section box are two cakes of the candy mentioned in CANDY FOR BEES, and between these cakes of candy is a tin bottle of water, having a small hole pricked near its lower end. These tin bottles are filled with a tin oiler (containing water, of course, instead of oil.) With sugar to eat, and pure water to drink, the bees stand almost any degree of summer heat in safety; and although we have sent such cages clear across the continent, a loss has been a very unusual thing since we have got our cages perfected.

CAGES FOR SHIPPING BEES.

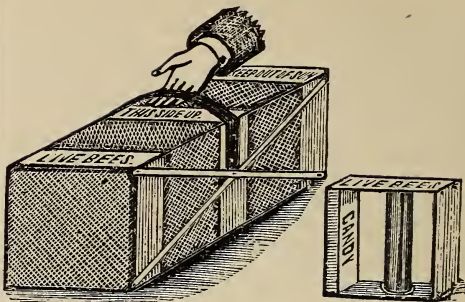
Bees must of a necessity be sent by express; none are allowed by mail except the dozen or two that accompany the queen, and freight is altogether too slow.



CAGE FOR $\frac{1}{2}$ LB. OF BEES.



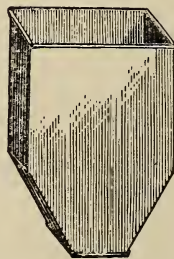
CAGE FOR $\frac{1}{2}$ LB. OF BEES.



CAGE FOR 1 LB. OF BEES.



YUCCA BRUSH FOR BRUSHING BEES OFF THE COMBS AND TUNNEL.



TIN TUNNEL FOR SLAKING THE BEES INTO THE ABOVE CAGES.

With the above tunnel, an expert will put up a pound of bees ready for shipment, in five minutes, after finding the queen. After using the tunnel a dozen times or so, the honey that shakes against the inside should be washed off, and also the yucca brush that is used to brush them down. When the tunnel is dropped, it should be set with its mouth on the ground, and the small end covered with the small cap, to keep robber bees from sucking up the new honey. The cages may hold more bees than the weight named, especially in cool weather; in fact, we often put $1\frac{1}{2}$ lbs. in a 1-lb. cage; but if the weather is hot, it is not safe to put in more than 1 lb. For *very long* distances we use a 1-lb. cage for only half a pound of bees.

CONCLUSION.



"It is customary," said I to my wife, "to have several leaves in the back of every book, with nothing on them; two or more leaves, of blank paper. Now it is almost as easy, to have something useful printed on these leaves, as to have them blank. Why shall we not use them?"

"But, my husband, your book will look badly; just think of having the reading matter reach the cover. Will it not look strange and singular?"

"Does it look strange and singular to see advertisements on these concluding pages, in close contact with the reading matter?"

"Well no, I do not know that it does, but that you know is different."

It is "different," my friends, and I presume more than one of you have noticed the broad difference between the matter contained in the book, and the character of the advertisements contained in these last pages. I beg pardon for this little bit of fault finding, and will try to remember that I am only responsible for the last pages of *my* book, and not for those of other people's.

Now then, with the young bee-keepers, with the boys and girls, and perhaps also with the men and women, who have read my A B C book thus far, and all who feel they are young in the art of keeping bees, I would have a little friendly talk. I wish you to let me feel as if perfectly well acquainted; so much so that I might come in without knocking, or any introduction, and talk about home matters, *your* bees and bee-hives, or any thing else, wherein my experience might enable me to help you. I can almost imagine, already, that some bright youngster who has been eyeing me keenly and curiously thinks, if he does not say it outright:

"Havn't you got something to sell, Mr.?"

"No, my boy, I have nothing to sell; at least, not to day. I keep things to sell, when

at home, but now I am making you a visit, and what I wish to tell you about is given away, without money, and without price."

"Isn't it a Chromo?"

"No, it isn't a Chromo. Come with me, and you shall see. Isn't that funny? 'Come with me and you shall see.' Tell sister to come, and if all the rest will come too, we shall be *very* glad to have them. Have you a hoe? Well, bring that, and have sister bring her little broom. We are going to build a little village. We will have streets and houses in our village, and we will have folks live there too. Oh, such folks! for they not only work hard all day, but they come pretty near working all night also."

"Is it the bees?"

"You have guessed it exactly, 'Sis,' it is the bees, and their hives are to be the houses."

"But they will sting."

"Not if we get acquainted. How did you get acquainted with me?"

"We 'talked.'"

"That is the idea exactly; we are to talk with the bees, and get acquainted."

"Bees can't talk."

"Oh, but bees *can* talk. They can talk in their way just as your old Rover talks to you, and just as the hens and chickens do. It is true, they do not talk with their mouths as we do, but for all that, they talk, and very plainly too, as I think we shall see. When Rover is glad to see you, what does he say?"

"He says 'Bow, wow, wow, wow,' and wags his tail."

"Very good. Now, when you are gathering the eggs, and you find one of the hens that sticks to the nest and won't get off, what does she say when you try to get her off?"

"I *know* what she says, but I can't say it. She says, 'cr-r-r-r, cr-r-r-r,' and she pecks."

CONCLUSION.

"Well, you know exactly what she means do you not? Does she not say, as plainly as words could tell it, 'You go way off, and let me be; I *will* sit, if I want to. They are my eggs, for I laid 'em'?"

"Well, now the bees talk just as plainly as the hen and dog, but as you are not acquainted with them, I will go along and act as interpreter. That is, I will tell you what they say. As little folks are pretty easily frightened or discouraged, I think mamma had better fix some sort of a veil on your hats, until you get a little used to the business. Any sort of an old veil will do, or some new ones can be cheaply made, of a piece of tarlatan. Now notice; if I go up to their hives and stand in front of them, they will buzz all round me, and pretty soon, if I do not move, they will begin to 'scold,' very much as the old hen did; and to me, it is just as plain, what they want. They want you to get away, so they can go on with their work. When you go up to the hives, always be careful to stand at one side of their line of travel, and then they will be much less likely to try to drive you away. Almost every hive has a particular 'path' through the air, and we are to watch and see where this path is, and let them have it, full width.

"Now boys, for business; pull down all the old sheds there may be around the bee hives, clear away all rubbish, and if the hives are set on any kind of benches, clear these all away, and set them right on the ground; or rather, raise them on 4 half bricks, laid down flat; if we are going to have a convenient village, we must have the houses on the ground, not up on stilts.

"We have not called upon papa yet, but now we shall have to ask him for a load of nice sawdust, and then we are ready for the little broom and hoe, to make the streets and lanes and alleys of our city. It *may* be a little city sometime, if we keep at work as the bees do, and do not get discouraged.



DRONE COMB.

WORKER COMB.

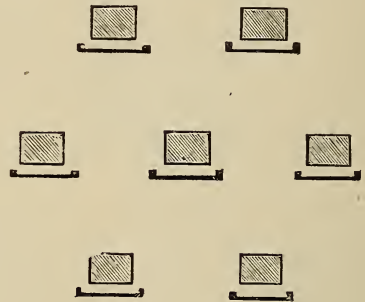
Now I expect you will disagree with me, when I tell you how we are to lay out the streets; for I am going to plan our city, just as the bees plan their rooms inside their houses. If you look at a piece of honey

comb, you will see the cells are six sided, like the above.

"There are several reasons why the bees cannot have square rooms, as we do, and one of them is that the bees are round, and would not fit in square cells. A young bee, I imagine, would find himself quite uncomfortable in a square cradle, and if the cells were made round, they would not fit up against each other, as they do now, without waste corners. So you see the bee makes his cell six sided to save room, labor, and material. Now we wish our bee village made six sided for the same reason, and to save travel, in working among them. If you have only seven hives, we will make them stand about like this; one in the center, and six around it.

"You see by the drawing, how the hives are to be placed, and where the sawdust is to be spread for the paths. On the south side of each hive, I have shown you the grape vine trellis you will probably have after a while. You can just see the tops of the posts, and the top strips.

"As we must have everything exact in laying out a city, we will cut a stick just six feet long, and arrange all the hives so they are just six feet from the center one, and from each other. Make a nice walk of sawdust from the hives to the house, that we



HEXAGONAL APIARY OF 7 HIVES.

may not get mamma's floor muddy when we run back and forth; now make a walk between and around all the hives, and bank sawdust up nicely all round them, to keep them warm, and to keep the grass and weeds from growing in the way before their doors. If you will fix their doorways all nice and clean, they will get just as proud of their homes, as the old hen does of her chickens; you see if they do not.

"If the hives do not stand just as you want them, or pretty nearly so, when you commence, you must move them into place a little at a time each day, or you will make

CONCLUSION.

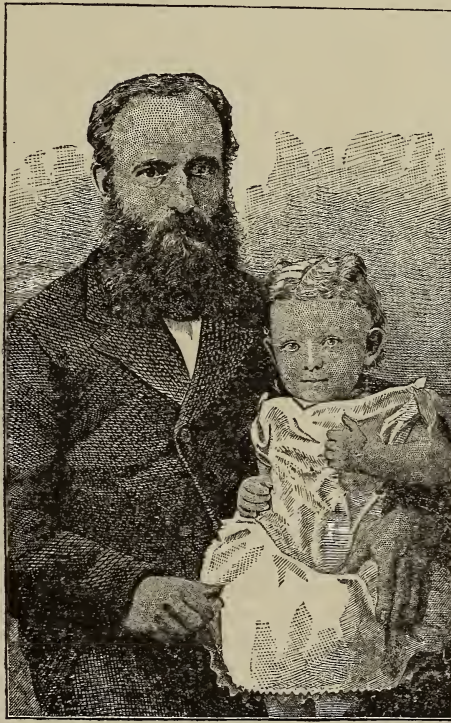
serious trouble. If you move a bee's hive, even a few feet, he is as much lost as you would be, if your own house were moved a mile, for he always comes home to the exact spot from which he started out. If you commence your improvements in the spring, before the bees begin to fly, you can set the hives anywhere you choose, without making any trouble, but you cannot do this in the summer time while they are flying. When the sawdust is all fixed, sister is to keep the paths all swept neatly with her little broom, and all hands are to contribute in keeping everything neat and tidy."

"But we have not heard the bees 'talk' yet."

about bees' talking, for they do it with their wings, and not with their mouths.

"I think each one of you children may choose which hive he will have, and then we can see who will get most honey from his or her hive. We have a little blue-eyed girl at our home, and she has a hive that contains the prettiest queen, the prettiest and gentlest bees, and they have made the nicest little cakes of honey, of any hive in our whole apiary, and there are nearly a hundred in all.

Now while I think of it, I believe I will show you a picture of myself and "Blue Eyes," so that you would readily know us, if we should ever come to see you. Here it is.



NOVICE AND BLUE EYES.

"Haven't you? Well, just go up to a hive on the back side, and rap gently, just as if you wished to come in."

"They say Buzz-z-z-z-z."

"Well, what do you suppose that means?"

"I guess it means, 'Go right away, and let us be.'"

"Very good; after we know them a little better, I think we shall be able to understand almost all they say, or at least all they wish to say. Now there is something funny

If you will look at our apiary on the back cover of this book, you will see her hive right in front of the door of the honey house. She has a little broom, and sweeps the sawdust up around the hives, and stamps it down with her little foot, and she isn't afraid of the bees, one particle. She has never been stung at all, while at work among them. If you will turn over to the picture of the House Apiary, you will see where she and her sister Maud, have their play house. It is up stairs

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where the plants stand out by the window. You can see them both, standing on the steps, but the man who made the picture did not try very hard, I guess, when he made their faces, for it does not look very much like them. They have never had any trouble with the bees in their play-room, except one day when they had some very nice water-melon for tea, and the bees came to tea too, and liked the water-melon so well that they went home and told the rest of the bees (don't you see bees can talk?) in the hive, about it, and so many of them came that the children ran to ask me what they should do. You can see me in my camp-chair down by the door of the house. You see I had a nice young queen that I wanted to have lay eggs, because I knew after she had commenced laying eggs, we should soon have a nice lot of young bees in the hive. Well, it was rather dark in the house where their hive was, so I took the comb with the bees on it, carried it out doors and sat down to look for the tiny white eggs.

"After the bees get acquainted with you, they will not scold and tell you to go away, but will light right on your hand or face, and sometimes they light right on my nose. I suppose it is because my nose is rather large, but it does not make me feel bad at all, if it is large, for I know that God made it so. When we come to die, I expect he will ask all about our lives, whether we have been good or bad, and whether we have talked bad and told lies, or stolen things, but I do not believe he will ever say one word about our noses.

"I almost forgot to tell you, that our 'Blue Eyes'—her name is Constance, and we call her 'Conny' for short,—always comes up to the shop to tell me when the bees are swarming. Some days when I am writing with my type writer, just as I am now, all at once somebody will say, 'Papa! bees is swam'in', and I tell you I 'hustle,' for I do not want my nice queens to go off and get lost. When I get home, I usually find that my wife has hunted out the queen, and has got her in a cage. We tie the cage on the rake, with a green bush, and pretty soon the bees all cluster all round her. One Sunday I had to go off to teach Sabbath-school, and I was afraid some of the bees would swarm, so I told Ernest (he is our boy, 14 years old), that I would give him a dollar for every swarm he would hive while I was gone. When I got home I found a 'great big swarm' had come out of Connie's hive, and he had hived it all just as nice as I could have done,

"Do you go to Sunday-school?"

"I am too little, and it is too far."

"Do father and mother go?"

"They go to meeting."

"Does brother go?"

"I guess *he* don't think very much about it."

"Do any bad boys live around here?"

"O yes! there is some that is 'awful' bad. They shoot guns on Sunday, and sometimes they steal our bee-hives in the night?"

"We would be really glad to have these boys become good, and stop doing these wicked things, would we not?"

"But they won't never go to Sunday-school."

"I know they are not very apt to go, but sometimes very wicked boys feel badly and are sorry, and if somebody would talk with them, and help them a little, they would make really good men. Sometimes they have no kind father and mother to take care of them, as you and I have, and perhaps nobody has been kind to them.

"Now I think it is just as nice to have a good Sabbath-school, as it is to have a nice apiary, and I am not sure but that one helps the other. You go to school, do you not?"

"Yes, and we have just the nicest school ma'am."

"Well that is *very* fortunate, for I am sure she will be glad to help you start a Sabbath-school. You can talk to her about it, and get her to ask permission of the trustees to hold it in the school house every Sunday afternoon. If you can get the minister to come and help start it, it will be a very good plan, but if not, get the best man you know of, to come and ask God to help you all to go to work right. We must work in the Sunday school exactly as the bees do in the hive. We must work all together. Do you suppose the bees in the hives ever scold or get mad at each other? Sometimes their honey is all gone and they have to starve to death, but from what I have seen of their actions, I do not believe they ever blame each other, and say 'It was all your fault, you might have worked better when honey was plenty, like *we* did.' On the contrary, they seem to work together just as your right hand works with your left. Did you ever have your right hand get mad at your other and strike it?"

"Why, no; one of my hands could not get mad at the other."

"Did you ever get mad and strike your brother?"

"Yes, but that is different,"

CONCLUSION.

"It is different, that is true; but why cannot you feel towards your own brother, just as you do toward your left hand? Do you not think we would all be much happier? Don't you think our mothers would be pleased if we did that way? We would all stop finding fault, and what a happy world it would be?"

"But folks don't do that way. We can't always be good."

"True, true; we can not always be good, but cannot we always keep trying?"

"I guess we could, if God would wait a little sometimes when we are real ugly."

"Well, I think he will, if we do the very best we can. Now it is almost time for me to go home, but I hope you will get your teacher, your parents, and everybody else, from the baby clear up to grandpa and grandma, to help start that Sabbath school. God will take care of you all, and tell you what to do, if you only ask him, and the bad boys will all come too, after a while, if you are all kind and pleasant, just as I told you the bees were. You will need some of the Gospel Hymns to sing from, and you will need lesson papers, and some little cards, for the children who learn the Golden Texts, and some of the pretty Sunday-school papers that are printed nowadays. Do you wonder where all these are to come from? Well, if you ask God to send them, and keep working as the bees do, they will all come pretty soon. Do you ask how you shall work? Well I guess the first thing will be to be kind

and pleasant to every one, and to ask them all to come and help the school along. God will tell you when you are working in the right way, by making you feel more happy and joyous, than you ever did before in life. You will like your bees better than you ever did before, the flowers will seem prettier, the grass greener, and all the world more beautiful, just because you have been trying to help the world to be good, instead of being altogether selfish. Whenever you help anybody to do right, you have helped God, and he always pays folks for doing such work, by making them very happy.

"There, now I must go; remember the bees, do not let them starve, and oh, my friends, do remember the Sabbath-school, do not let it drop or dwindle down, but show God that *you* can be depended upon, even if it does storm and blow. He that is faithful in a few things, shall be made ruler over many."

I have several times found colonies of bees so nearly dead from starvation that a great part of them were down on the bottom of the hive, and so weak as to be but just able to move. When honey was given them, the first ones would take a good load, and just as soon as strength returned they would hasten to feed the rest; they too would revive, and very soon all hands were as busy as they possibly could be, passing it round and helping the others, until all were ready to join in one grand jubilee of thankfulness for the timely succor. Can not we learn of them, two lessons; first to spread everything that is good, freely and unselfishly, and then to unite in a joyous thanksgiving for the peace and plenty that we enjoy as a people.

GLOSSARY.

FIGURES AT THE CLOSE OF A DEFINITION REFER TO PAGES OF THIS BOOK.

- Abdomen of Bee.*—The terminal division of the insect, composed of a variable number of rings.
- Abscending Swarms.*—One that from any unnatural cause leaves its hive, 1.
- Adair Hive.*—See Hives.
- After Swarms.*—Those issuing after the first swarm, 3.
- Alighting Board.*—A board in front of the entrance to a hive, on which the bees alight, 5.
- American Hive.*—See Hives.
- Apiarian.*—One who keeps bees. Apiarist preferable.
- Apiarist.*—See p. 11.
- Apiary.*—See p. 11.
- Apiculture.*—The culture of bees.
- Apis* (Latin).—The family to which bees belong.
- Aphides.*—A kind of plant lice that emit a liquid sometimes gathered by bees, and called honey dew, 19.
- Artificial Comb.*—Comb Foundation, 19.
- Artificial Fertilization.*—Impregnation of queens in confinement, 19.
- Artificial Heat.*—Warmth artificially produced, and applied to bees, 20.
- Artificial Pasturage.*—Plants and trees cultivated for the honey they yield, 20.
- Artificial Pollen.*—Rye meal or other substances fed to bees as a substitute for natural pollen, 139.
- Artificial Swarm.*—A colony made by the division of one or more swarms, 21.
- Balling.*—The manner in which bees cluster about a strange queen, in attempting to sting her.
- Bee Bread.*—See Pollen.
- Bee Climbers.*—Apparatus to assist one in climbing bee-trees, 30.
- Bee Culture.*—The care of bees.
- Bee Dress.*—A suit adapted to prevent stinging by bees, 26.
- Bee Gum.*—Term applied to that part of a tree or log which is, or has been, occupied by wild bees. Applied by our friends in the South to all kinds of bee hives.
- Bee Hive.*—A box or other receptacle made by man, to be used as a home for the honey bee, and usually containing but one swarm. (See Bee Gum and Skep.)
- Bee House.*—A house for bee hives. Also applied to the rude sheds seen about the country, where one or more hives are crowded together.
- Bee Line.*—The most direct route between two places.
- Bee Moth.*—A grey miller, $\frac{3}{4}$ in. long, the larvæ of which feed upon and destroy combs, 31.
- Bee Plants.*—Plants which are valuable as honey producers.
- Bees Wax.*—See Wax.
- Bee Tree.*—A tree occupied by a swarm of bees.
- Bell Glass.*—A bell shaped glass used much in England for surplus honey.
- Black Bees.*—A species whose color varies from dark brown to black. They are natives of Germany.
- Bottom Board.*—The floor of a hive.
- Box Hive.*—See Hives.
- Box Honey.*—Honey stored in boxes or sections.
- Brimstoning.*—Fumigating with sulphur. See Fumigating, and Taking up Bees.
- Broad Frame.*—A frame used for holding section boxes.
- Brood.*—When applied to bee culture, larvæ in all stages. Not applied to bees after emerging from the cell, however young they may be, 34.
- Brood Comb.*—Either worker or drone comb used for breeding; usually applied to worker comb.
- Brood Nest.*—The space inside the hive, occupied by eggs and brood, extending in all directions from the center.
- Brood Rearing.*—Raising bees, 34.
- Candied Honey.*—Honey that has solidified, 40.
- Capped Brood.*—See Sealed Brood.
- Capped Honey.*—Honey in cells that are sealed with wax.
- Cappings or Caps.*—The covering of brood or honey in cells.
- Cell.*—A hexagonal depository for honey, and apartment for brood rearing, made by honey bees of wax; two sizes. See Honey Comb and Wax.
- Chaff Hive.*—A hive having double walls filled with chaff at all seasons, 94.
- Chrysalis.*—State of Brood in transition from larvæ to a fully developed bee. Termed also pupa and nymph.
- Closed End Frame.*—See Hives.
- Closed Top Frame.*—See Hives.
- Clustering.*—Manner in which numbers of bees cling together.
- Colony.*—A stock or swarm of bees, consisting principally of worker bees; but has, when perfect, one queen and an indefinite number of drones.
- Comb.*—See Honey.
- Comb Basket.*—A tin receptacle, with handles and a close fitting cover, for containing combs, or carrying them from place to place, 43.
- Comb Foundation* (Abbreviated, fdn.)—Thin sheets of wax, which have been passed between the two rollers of a fdn. machine, having the shape of the bottoms of cells with their edges partially raised. An artificial fdn. or partition upon which bees build comb, 44.
- Comb Foundation Machine.*—A machine consisting principally of two metallic rollers engraved with such accuracy that thin sheets of wax passed between them will have the form of the bottoms of cells, 44.
- Comb Holder.*—An apparatus which may be attached to the outside of a hive to hold a frame of comb.
- Comb Honey.*—Honey which has not been removed from the comb.
- Comb Guide.*—Generally a wooden edge, or a strip of comb or fdn., in the top of a frame or box, on which comb is to be built.
- Cushion.*—A case or bag filled with some soft and porous substance, as chaff, for covering brood frames on top or side.
- Cyprian Bees.*—From the Island of Cyprus. They differ but little from the Italian.
- Davis' Transposition Process.*—See Grafted Cells.
- Decoy Hive.*—One placed in position to attract abscending swarms.
- Dividing.*—Separating a colony into two or more, by removal of combs or bees, or both, 55.
- Division Board.*—A board, of the same length and height of the inside of hive, used for contracting the size of apartment.
- Dollar Queen.*—Fertile queen, that has been laying less than 21 days, and reared from pure Italian mother, 159.
- Drone.*—A male bee larger than the worker, useful for nothing except filling the sexual office, 56.
- Drone Brood.*—Brood in drone cells, (see Cells) from which drones are hatched.
- Drone Egg.*—One that is unimpregnated, laid by a virgin queen, or fertile queen, or fertile worker.
- Drumming Bees.*—Driving from hive, by pounding on the outside, 212.
- Dysentery.*—A disastrous disease affecting bees in the spring; cause, cure, &c., 69.

GLOSSARY.

Dzierzon Theory (pronounced Tseert-sone).—The theory of Dzierzon, formulated into 13 propositions, treating mainly of queens, their virginity, fecundation, and fertility.

Embryo.—The first rudiments of existence of any plant or animal.

Entrance.—An opening in the hive for the passage of bees.

Entrance Blocks.—Three-cornered pieces of wood, for regulating the size of the entrance, 7.

Egyptian Bee.—If it differs from the Italian, it is in being lighter colored and exceedingly cross.

Extracted Honey.—Honey taken from the comb by means of an extractor.

Extractor.—See Honey Extractor and Wax Extractor.

Fdn..—Abbreviation for comb foundation, 47.

Feeders.—Arrangements for feeding bees, 73.

Fertile.—Productive, laying; as, fertile queen or worker.

Fertile Worker.—A worker that lays eggs which produce only drones, 78. See Worker.

Fixed Frame.—See Hives.

Foul Brood.—A malignant, contagious disease, being a species of fungoid growth which affects brood, 80.

Foundation.—See Comb Foundation.

Frame.—A movable structure of slats, generally four cornered, in which bees build comb which may, by this device, be changed about inside, or removed from the hive at pleasure. It was brought into use by Rev. L. L. Langstroth, in 1851. See cut and Hives.

Fumigate.—To expose to smoke; to apply the fumes of sulphur.

Gallup Hive.—See Hives.

Glucose.—See grape sugar.

Granulated Honey.—Honey that has formed into grains, in passing from a viscous to a candied state.

Grape Sugar.—A saccharine substance less sweet and less soluble than cane sugar, made principally from Indian corn; is called Grape Sugar because it is identical with the sugar found in grapes. It is often confounded with glucose, with which it is nearly identical but glucose contains more dextrose than grape sugar, which renders it a permanent liquid, grape sugar being a permanent solid. Both substances are well known in commerce, and while glucose may, by chemical means, be converted into grape sugar, grape sugar cannot, by any means known at present, be converted into glucose. The sweet principle of both substances is known under the general term of grape sugar, to distinguish it from cane sugar, and as the manufacture of these articles, as an important industry, is of rather recent date, our dictionaries and cyclopedias, so far as I can learn, have failed to make any distinction between the two. As the sweet principle of honey is grape sugar, these substances, when made pure, are a more natural food for the honey bee than cane sugar.

Green Honey.—See Unripe Honey.

Guide Comb.—Pieces of comb used as guides for building combs in brood frames or surplus boxes.

Hatching Brood.—Brood just emerging from the cells.

Honey.—The nectar gathered by bees from flowers, and brought to a viscous state, by evaporation inside the hive, after being deposited in the cells.

Honey Bag, or Honey Sack.—An enlargement of the gullet or first stomach, in which the bee carries the nectar gathered from flowers.

Honey Bee.—In general, any bee that gathers honey; but applied to the smaller classes in distinction from the bumble bee, in that they gather much larger quantities of honey.

Honey Board.—A board formerly used on top of frames, containing holes or slots over which were placed surplus boxes; now but little used.

Honey Box.—A receptacle for surplus honey, closed on all sides, but with entrance holes for bees. Mostly discarded now for the section boxes.

Honey Comb.—A sheet of hexagonal cells, the same on both sides, having a middle wall or partition. When new, weighs $\frac{1}{2}$ lb. per sq. ft., requiring for its production about 5 lbs. of honey. Brood combs are $\frac{3}{4}$ in. thick; but, owing to the shape of the bottoms, each cell has a depth a little greater than half the thickness of the comb. Combs of this thickness will hold 3 lbs. of honey per sq. ft.; but the cells may be lengthened to the capacity of 10 lbs. per sq. ft. Worker comb contains 25 cells per sq. in., on each side; drone comb, 16 cells per sq. in., on each side; cells of both are of the same depth. Sides and bottoms of cells are, when new,

1-180 in. thick. The bottom of each cell is formed of 3 rhombs, so united as to make the center of each cell the lowest part, which point is the center of three cells on the opposite side. The bottom of each cell thus forms a fourth part of a rhombic dodecahedron, and a third part of the bottom of each of the three opposite cells. Honey comb is made by the honey bee, from scales of wax. See Wax.

Honey Dew.—See p. 114.

Honey Extractor.—A very ingenious contrivance by which centrifugal force is made to throw the honey from frames or pieces of uncapped comb.

Honey Gate.—A cast iron fixture, for drawing off honey from extractors, barrels, &c.

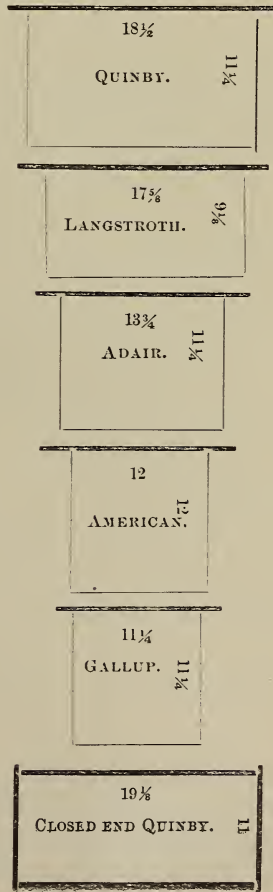
Honey House.—A building used for storing honey, combs, hives, and apiarian implements; also for extracting honey and doing other work pertaining to the apiary.

Honey Knife.—A thin, double edged, steel blade, with inclined handle, used for uncapping honey for the extractor.

Hives.—I have not thought best to describe the different kinds of hives in the main part of my book, lest I should confuse the beginner by details that I cannot think at all important to his success. I have thought best to give a brief description here of the hives in use, that our readers may be able to converse in regard to them understandingly, when occasion requires. Of course, none but movable comb hives are worthy of consideration nowadays, and as the frame is the principal part of any hive, I will make a diagram of the principal sizes and dimensions in use as below.

DIAGRAM OF PRINCIPAL FRAMES IN USE.

Figures given are outside dimensions in inches. Suspended frames have $\frac{3}{4}$ inch supporting arms, or an equal prolongation of top bar.



GLOSSARY.

QUINBY SUSPENDED FRAME, AND HIVE.

The first 5 are what are called suspended frames, because they are supported or suspended rather, by elongations of the top bar, or other equivalent devices. Mr. Langstroth has the credit of inventing this form of movable frame; but, as this, like almost every other invention, seems to have been the joint work of a great many individuals, it is likely that to him rather belongs the credit of first bringing it practically before the public. Mr. Quinby made the frame figured at the top of the list, after seeing Mr. Langstroth's book, in 1856. If I am correct, he chose those dimensions that he might have a hive just about a foot square and a foot and a half long inside. Judging from his experience with box hives, he doubtless thought these would be about the right dimensions. It is quite a misfortune to the bee-keeping world at large, that he did not adopt the exact size given in Mr. L's book, especially when he came so near it. I believe one reason he gives for choosing a size a little larger was that he could thus use only 8 frames, where Langstroth used 10. This is quite an important advantage, it is true; but, as a great many bee keepers who use the Q. frame (including among their number Mr. L. C. Root, who has just (July, 1879) revised Mr. Quinby's book) have reduced the size of the Quinby frame to about that of the L. frame, I think we may safely call the frame as given by Mr. Q. rather large. Again; Mr. L., in deciding on the dimensions of the frame he has given us, contemplated its being used in a two story hive, which, I believe, Mr. Q. did not; this would readily account for the extra depth Mr. Q. gave. The Q. hive for this frame was simply a box a foot square inside, and 18 inches long, as I have before mentioned. The entrance was, I think, an auger hole, and the honey was taken from boxes placed on the top, much in the same way as from the box hives which Mr. Q. had been recommending.

THE LANGSTROTH FRAME AND HIVE.

I have given above, and under the head NUCLEUS, the principle reasons for the dimensions of this frame. Other reasons being equal, the fact that there are more of this dimension of frames in use, than of all others combined, should have some weight in deciding what frame and hive to use. None but one who has gone through the matter by actual experience can estimate the difficulties and annoyances caused by having hives and frames of different dimensions in the same apiary, or even in the same neighborhood. There will always be more or less buying and selling of hives, bees, &c., and where the hives and contents are all made from one exact and fixed gauge, there is little trouble; but where there is even a slight variation—even the fourth of an inch, it makes troubles innumerable. It is on this account, I would most earnestly plead with you to adopt the regular L. frame, if you can come anywhere near to it. While 10 frames are the standard number for a single story, there are those who use more, as well as those who use less. Adam Grim and others who have made quite a business of selling bees, have adopted 8 framed hives; and, as such a hive of bees was sold at about the usual price, there was, of course, a saving to the one who sold them. As these narrow hives cannot be used interchangeably, on or beneath the standard size, I would not advise them. We have now a lot piled up against the fence, just because they are too narrow to be worked with the rest. For the same reasons, and on account of getting boards wide enough for such covers, I would also object to hives containing more than 10 frames; if more room is wanted, put on an extra story. I have objected to the old style L. hive, such as Mr. L. gave us, principally because the upper story was made to fit over the lower one, and could not therefore be used of itself independently, as a one story hive. It also required much waste lumber, to allow of frames of one size being used in both stories. Compared with the Simplicity, they are heavy to handle, expensive to make, complicated and bulky when they are to be stored away or shipped, and yet their inside dimensions are, after all, no greater.

ADAIR FRAME AND HIVE.

Ever since Mr. L. gave us the dimensions of the frame he preferred, those who have had less experience than he had have been insisting that the frame is too shallow, and advising other dimensions. The frame which I have called the Adair was not recommended by Mr. A. *specially* for this reason, but because he thought it more suitable for the peculiar hive he so strenuously advised about the year 1872.

This hive, which, I suppose, should be termed the Adair hive more because he brought it so prominently before the public than because the idea was of his own originating, was termed by him the "New Idea Hive"; said idea being to arrange the frames in one long row, rather than to have an upper story, or any kind of a surplus receptacle above the brood nest. Such great things were claimed for this hive, that it was tried all over the country, and hives were made to contain not only 20 and 25 frames, but Adair even claimed he could get a queen to rear such a swarm of bees that a hive *four feet long* would be needed to give them room; and I presume hundreds, if not thousands, of such hives were made and used. Like other similar inventions, they were said to be a success, and some there were who even went so far, as to stock their whole apiaries with such hives. Like other things again, and I hardly know why, the bees, in a couple of years, were taken out of these long hives, and they were put away out back of the barn, or somewhere else, and that was the last of them. At present writing, July 7th, 1879, I know of but two bee keepers who use them, and they do not use them anything like four feet long.

Before closing the subject of what has been called, in pleasantry, the "long idea hive," it may be well to state that an unscrupulous vender of patent hives, N. C. Mitchell, by name, about the time every body had dropped this "long idea" as a mistake, commenced to introduce it to country people, as his patent hive, claiming it as his own invention, and that the most wonderful things could be achieved by its use. At the same time, he claimed to have a patent also, on all division boards for hives, and has been, for the past four years, blackmailing innocent farmers, by threatening them with prosecution, unless they hand him over \$10. for the right to use, etc. Where they used neither the long hive nor division board, he claimed also to have a patent on a simple cloth cover, or any kind of a quilt, placed over the frames, and thus obtained, and, I fear, is yet obtaining, considerable sums of money. When the matter is sifted down, it is found that this Mitchell has a patent only on an iron lug to be applied to a division board, which is so impracticable that neither he nor any one else has ever made use of it; a fair sample of the way patents on bee hives turn out when investigated.

THE AMERICAN HIVE AND FRAME.

The hive known throughout the country as the American hive was invented by H. A. King, about the year 1865. Mr. K., it seems, considered the L. frame too shallow, and sought to make a tall hive like the box hives in common use, having movable frames like the L. hive. While a shallow frame may be lifted out at the top of the hive very readily, it is much more difficult to use a frame a foot deep or more, in the same way. To obviate this, he made the hive with a movable side. A great many hives were sold, and it was very extensively introduced, perhaps more so than any other patent hive that has ever had an existence. I believe the decision has been pretty general, however, that the movable side is a very undesirable feature, as well as the tall frame it was designed to accommodate, and the hive has been either discarded or so much modified that none of the patented features are left. The frame was, originally about 12½ wide, by 16 or more inches deep, but after the long Adair hives came in vogue, or about that time, it was changed to a frame exactly a foot square outside. This was a gain, in getting it into a regular size, but the American hives scattered about the country contain frames of such a diversity of dimensions, that the term American frame or hive scarcely means anything. Reducing the depth to 12 inches was a great improvement, but even that is too deep for a two story hive, and most hives, since the advent of fdn., are used two stories high or more.

THE GALLUP FRAME AND HIVE.

This frame was first brought prominently before the public, by Elisha Gallup. He used so small a frame, because of the facility it gave for building up small colonies or nuclei. The hive he recommended was, at first, about 13 inches long, holding 12 such frames. It is the frame used and advised by Prof. Cook, G. M. Doolittle, and many others, and there are those who claim that better results can be secured by it than by any other of the larger frames. It is possible that this is the case in the hands of one long used to this frame, but I think the masses generally will succeed just as well with the L. frame. It is objectionable, because it is too deep to be used

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to good advantage in a two story hive, and the advantages of having both upper and lower story exactly alike are too great to be lightly ignored. It is also objectionable, because there are more frames to be handled, to accomplish a certain amount of work. At one time, friend Gallup used two rows of these frames side by side, and named it the "twin" hive. These, like the Adair long hive, were considerably used, and some large results obtained from them, but they are now, I believe, laid aside again, for the old two story plan of giving more room, and getting surplus.

CLOSED END QUINBY FRAME AND HIVE.

Ever since Langstroth brought out the movable frame, there have been, every now and then, individuals advocating having the frames at fixed and regular distances, that the bees may be obliged to build their combs of exact thickness. I do not know what may be accomplished with the aid of *fdn.*, but, at present, the majority agree that combs as they are usually found, are better handled without being fastened at fixed and regular distances. The American frame, as it was made originally, had the top bar very nearly $1\frac{1}{2}$ inches wide; as this is the distance which brood combs should be from center to center, of course, the top bars came close together in this case, closing the space and forming a honey board or chamber floor, and making what is called the closed top frames. To be sure, there are some very decided advantages in such arrangements; such as, having the frames solid and substantially held when hives are to be moved, doing away with a honey board, etc. But, alas, the frames are not "movable," and although thousands of such hives were introduced and sold, nearly all of them were soon laid aside. The L. arrangement seems to be the only one that stands the test of years of service.

Well now, the Quinby hive of which I am about to speak is not a closed top frame, but it is a closed end frame. One great objection to the closed top American frame was, that it killed so many bees. Well our friend, Quinby, made a very long frame, and got the end bars so far away from the centre where the bees are generally found, that they would be far less likely to be in the way, when the frames were being closed up in place. It will be remembered that, in this frame, it is the ends that are made $1\frac{1}{2}$ inches wide, instead of the top bar. That they may not fall over too easily, a hook of hoop iron is nailed to one of the lower corners, which hooks on a strip of similar hoop iron nailed to the bottom board. It will be noticed that this closed end frame, Quinby hive is the simplest form of a movable frame that can well be devised. For a summer hive, 6 frames, with a pair of panels to close each of the outside ones and some simple board for a cover, is all that is needed. Of course, the whole must be placed on some kind of a flat board for a bottom board. If you wish a smaller hive, take out one or more frames and close in the panel; if larger, put in frames as long as they may be needed. The troublesome division board, in all suspended frame hives, is here dispensed with entirely. To be sure, the same idea can be applied to any of the frames mentioned; but with tall frames it is more troublesome, because you have the closed end bars nearer the bees, and there is a greater surface to be gummed fast, every time the hive is opened and closed. In fact, there is no standard size of Quinby frame, if I am correctly informed. Quinby's neighbors who use them, including his son-in-law, Mr. L. C. Root, and Capt. Hetherington, who, it is said, has over a thousand hives, all use different sized frames.

Why is not this frame and hive more in use? Because it places the combs at fixed distances, which will remain a great objection so long as the bees will persist in building combs of such irregular thicknesses. If you think this can easily be got along with, take two heavily filled combs, with bulged cells along the top bars, and try to make them come up together. With suspended frames, this can easily be got along with. Also, try to close up a hive made of so many loose pieces, and try to do it quickly, without killing bees. In short, try using such hives in the apiary a year or two, by the side of suspended frame hives. I know there is a man found, once in a while, (yes and I know one woman, too, a very successful one, Mrs. Astell, of Roseville, Ill.), who will give the preference to a closed end frame; but there are so few, in proportion to those who prefer the other kind, that I have thought best not to try to describe the hive in full, in my book. There are several who have used the hive a few years, and then, at great expense, have had the combs all transferred

into suspended frames. If any of you think you would like to adopt such a hive, I would advise you to purchase L. C. Root's excellent book, entitled "Quinby's New Bee-keeping."

I have said nothing in regard to surplus arrangements for these various hives, for those described in this book can all be adapted to them. Where a frame is very deep, the sections should be placed at the side, as well as above the brood nest, and are then termed Side Storing Boxes. As a general thing, it seems to be well decided that the hives with shallow frames give far the most surplus. This brings us to the subject of extremely shallow hives.

BINGHAM'S HIVE.

Mr. T. F. Bingham of Otsego, Mich., has used a hive, and I believe is using it still, with frames only 6 inches in depth. While such extreme limits may be used, and successfully, too, especially by those advocating them, they will, as a general thing, be found inconvenient by the masses. Very tall frames, very shallow frames, very large and very small frames, triangular frames, five sided frames, and, in short, almost every imaginable kind of frames have been used and patented. Yes, many of them have been tried and abandoned over and over again. Of late, it seems that a great many of them have been patented over and over again; for patent hives have got to be such a legion, it is not at all strange that the patent office officials should fail to be able to tell what has, and what has not, been patented. I would not discourage inventive genius, but I would caution our A B C class about traveling the same path over again so many times, not knowing that the ground has been thoroughly worked over before. As a general rule, I think the most ignorant class of bee keepers we have are those owning patents on hives.

House Apiary.—A double walled building usually of octagonal or rectangular form, in which bees are kept both summer and winter in separate hives as out of doors.

Hybrid.—A cross between two species. In bee culture, applied to a cross between blacks and Italians.

Hymettus.—A country of Greece, famed for the superior quality of its honey, which is of light golden color, and gathered from mountain thyme.

Italian or Ligurian Bee.—A native of Italy, distinguished by three bands of yellow across the upper part of the abdomen of the worker bee.

Italianizing.—Changing from any other species of bees to the Italian, 122.

Introducing.—Method of presenting a strange queen to a colony of bees, so that they will accept her.

Lamp Nursery.—A device used in rearing queens; a double walled tin hive, with space between filled with water kept warm by means of a lamp, 125.

Langstroth Hive.—See Hives.

Larva (pl. Larvæ).—The bee in the grub state, from the time of the hatching of the egg until the capping of the cell; in other words, unsealed brood.

L. Frame.—Langstroth frame (See Hives).

L. Hive.—Langstroth hive (See Hives).

Ligurian Bees.—See Italian Bees.

Lining Bees.—Noting the direction of their flight.

Mandibles.—Jaws of the bee, which work sidewise instead of up and down as in higher animals. — Cook.

Manipulation.—Handling of bees.

Mat.—A covering for brood frames to be used under the cushion, quilt, or sheet to keep them free from propolis, or they may be used alone, made of wooden strips, woven with cord.

Mel extractor.—Honey Extractor.

Metal Corners.—Tin Fixtures for securing corners of frames and forming on the upper bar an edged support, which can not be made fast by propolis, and under which no moth worm can secrete itself.

Mitchell Hive.—See Hives.

Movable Frame.—See Hives.

Natural Swarm.—A swarm which issues spontaneously.

Nectaræes.—The lower part of the petals of flowers where nectar is secreted.

Neuter.—See Worker Bee.

Non Swarming Hive.—One so large, or so constructed, as to control the desire to swarm, an end never yet satisfactorily obtained.

Nucleus (pl. Nuclei or Nucleuses).—A miniature colony of bees, generally used for rearing queens. Should have a queen or means of rearing one.

Nurse Bees.—Bees that care for brood; generally, those less than two weeks old.

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Nursery.—A place in which queens are reared. See *Lamp Nursery*.
Nymph.—See *Chrysalis*.
Observatory Hive.—A hive constructed partially of glass, to allow examination of work inside without disturbing bees.
Overstocking.—Having more bees in one locality than there is pasture to support.
Paraffine.—A white, translucent, crystalline substance, tasteless and inodorous, obtained from the distillation of mineral and vegetable tar. It resembles spermaceti. It derives its name from its remarkable resistance to chemical action.—*Webster*. It is sometimes used as a substitute for beeswax, for coating barrels and other utensils for containing honey.
Parasite.—A species of lice that live on the body of a bee, 63.
Parent Stock.—A stock from which a swarm issues.
Parthenogenesis (or Virgin Breeding).—The law that life is imparted by the mother independently, and that every egg, as originally developed in the ovaries, is of the male sex, but whenever fertilized it becomes transformed into a female.
Pollen.—Fecundating dust of the antheral part of the stamen of flowers, gathered by bees, and when mixed with honey used for food of young bees, sometimes called bee-bread.
Pollen Basket.—A slight cavity on the outside, just above the second joint, of each of the two hind legs, in which the pollen is carried, 137.
Propolis.—A resinous substance gathered, probably, from the buds of certain trees, by bees, and used in covering rough places, and cementing and filling cracks about the hive.
Pupa.—See *Chrysalis*.
Q. Frame.—Quinby frame.
Q. Hive.—Quinby hive.
Queen.—The only fully developed female in the colony; the mother of all the rest.
Queen Cage.—An enclosure of wire cloth, or of wire cloth and wood, in which to confine a queen for introduction or shipping, 38.
Queen Cells.—Elongated cells, in which queens are reared.
Queening.—Introducing a queen to a colony.
Queenless.—Having no queen.
Queen Rearing.—Raising queens, 159.
Queen Register.—A printed card so arranged as to show at all times the condition of the queen in the hive, on which it is tacked.
Queen's Voice.—A note frequently uttered by a queen, probably produced by her wings.
Quilt.—A cover for brood frames made by putting wool or cotton between two pieces of cloth, and sewing them together.
Quinby Frame.—See *Hives*.
Quinby Hive.—See *Hives*.
Rabbit.—Lately applied to a strip of folded tin, to be used in any hive where frames are suspended by the top bar, either with or without metal corners, to aid in making frames more movable, and to assist in keeping bees free from the ravages of the bee moth.
Rendering Wax.—Separating the wax from all foreign substances by melting and straining. Usually applied to the operation of converting combs into wax.
Rhomb.—An equilateral parallelogram, having two acute and two obtuse angles; one of the 12 equal sides of a rhombic dodecahedron; one of the lozenge shaped parts of the bottom of a cell, 110.
Rhombic Dodecahedron.—A solid having 12 rhomb shaped faces, 110.
Ripe Honey.—That which has by evaporation become sufficiently thick to be sealed in the cell.
Robbing.—The act of pilfering stores from another hive, instead of obtaining them in the ordinary way from the fields. It occurs only in time of scarcity of stores, 165.
Royal Cell.—See *Queen Cells*.
Royal Jelly.—Food of queen larvae, 149.
Sealed Brood.—See *Capped Brood*.
Sealed Honey.—See *Capped Honey*.

Section Box or Section.—A small box for surplus honey, open on two sides.
Separator.—A strip or piece, generally of tin, placed between two section boxes, to insure straight comb.
Sheet.—A covering of single cloth, for brood frames.
Skep.—A term sometimes applied to any sort of a bee hive.
Spent Queen.—One that from old age becomes incompetent to lay any eggs, or but few which produce drones only.
Spermatozoid (pl. Spermatozoa).—One of the Animalcula contained in the generative fluid of drones.
Spring Dwindling.—Slow decrease in size of stocks, in early spring, 241.
Starter.—Comb or fdn. fastened in the top of surplus boxes, to induce work therein.
Sting.—A weapon of defense, contained in the posterior part of the abdomen of worker bees and queens, composed of 3 parts, two of which are barbed, 192.
Stock.—See *Colony*.
Super.—Any receptacle for surplus comb honey, applied by our friends across the water to any kind of upper story.
Swarm.—A large number of bees leaving the parent stock at one time, for the purpose of taking up new lodgings, accompanied by one queen in the first swarm, and in after swarms (see *Colonies*) by one or more.
Swarming Season.—The time of year in which bees are most inclined to swarm.
Taking up Bees.—Killing bees in fall, to get the honey. A practice now going rapidly out of use.
Tested Queen.—One whose progeny has been examined and found pure, 160.
Transferring.—Changing bees and combs from one hive to another; changing comb from one frame to another. Usually applied to the operation of changing bees and combs from box hives to hives with movable frames.
Transposition Process.—See *Grafted Cell*.
Unqueening.—Removing queen from a colony.
Unripe or Green Honey.—Honey which has undergone but little change by evaporation, and contained in unsealed cells.
Virgin Queen.—A queen which has not been fertilized.
Wax.—A natural, unctious, secretion of honey bees, formed in delicate scales, in the eight wax pockets, on the under side of the abdomen. It is formed both in activity and in repose, but in much larger quantities while the bees are quietly clustered inside the hive. The production of each pound requires about 20 lbs. of honey. It is used by the bees for comb building, 222.
Wax Extractor.—An apparatus by means of which wax is rendered by application of steam.
Wax Pockets.—The 8 depositories under the rings on the under side of the abdomen of a worker bee, in which wax scales are secreted.
Wax Press.—A device for rendering melted wax by pressure.
Wedding Flight.—The flight of a virgin queen, for the purpose of meeting a drone.
Wild Bees.—A term applied to honey bees, that live in the forest, in hollow trees, or in cavities of rocks, or in other places away from the abodes of men.
Wind Breaks.—Tight fences or close hedges, to keep winds from the apiary.
Worker Bee.—Erroneously called neuter; an undeveloped female possessing the germ of nearly every organ of the queen, which may at any time become sufficiently developed to allow her to lay eggs, but only such eggs as produce drones. Does all the work in the hive except laying eggs.
Worker Egg.—An egg which is impregnated, and is laid only by a fertile queen: will produce either worker or queen.



WAX POCKETS.

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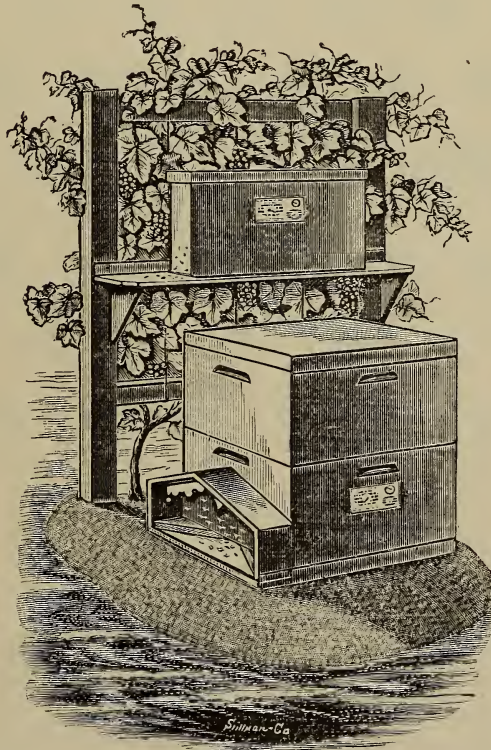
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A ONE-HIVE APIARY.

I have shown you a plan of an apiary for 7 hives, and over the leaf, is one for 55 hives; but before I close my A B C book, I want to just give you a picture of an apiary of *one* hive. Now I think it will pay you to make every swarm of bees as you get them, just like this one; or at least, I would have you fix up each one just as nicely as you know how. The Bible says you must be faithful over a few things, before you can be made ruler over many, and in nothing is this more true, than in the care of bees.

It is for this reason, that I would advise you to commence with a few stocks, and I would say commence with one, if it were not that there are some decided advantages in having two or more. If you are an entirely new beginner, and a young person, I would advise you to commence with just two hives, and to build up your apiary from just two. The bees will come if you are faithful, just as fast as you can take care of them. In fact they will come from the woods and alight in or near your apiary, just as if they said in plain words "We want to be taken nice care of, just as your bees are. Here! put us into one of those nice hives, and we will work for you." Some of you may be a little incredulous in regard to this, but scarcely a season has passed, that one or more swarms of bees have not come in just that way. I always give them a comb of honey and another of brood, and they go right to work with an energy that says very plainly, "We are going to do all *we* can, to build up the business." There is somehow a rare and keen pleasure, in setting these vagrant swarms at work, and I can liken it to nothing else, than pulling out a "whopping big fish," in my boyhood days when I went fishing.

Now if you look back at APIARY, you will see what I said about the grape vines for shade. Well, here is the grape vine all grown up, and loaded with grapes; the posts, pine strips and the three wires, etc.



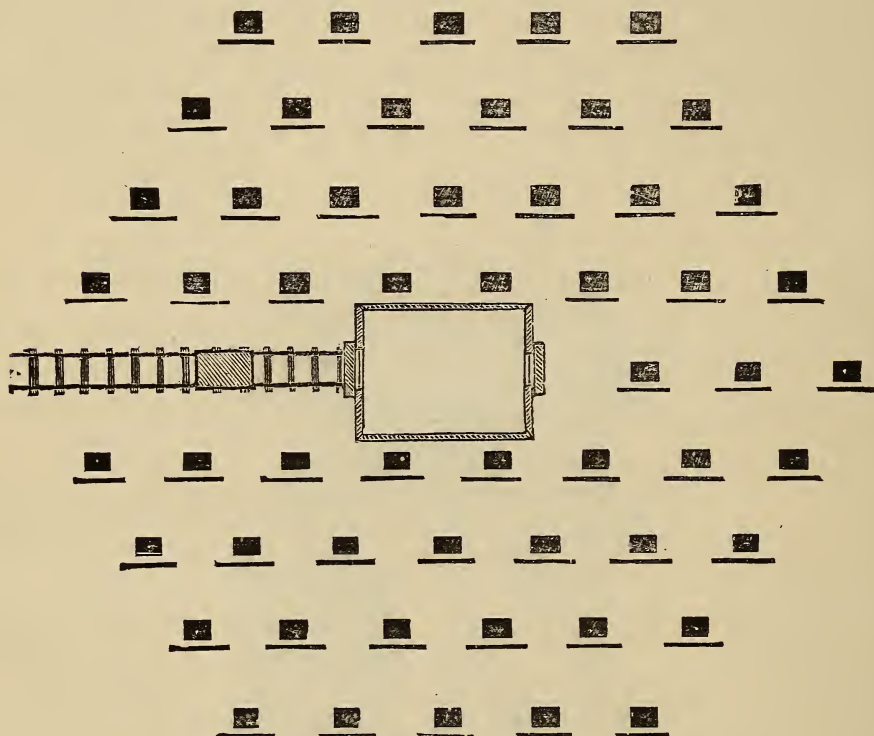
TWO-STORY SIMPLICITY BEE-HIVE WITH PORTICO AND ALIGHTING-BOARD,
QUEEN-REARING HIVE, &C.

After you have spread about a bushel of sawdust on the ground, you are to place the bottom-board on it, resting on four half-bricks. The bottom-board is to be placed the same side up as the cover. I am thus particular, because one friend informed me that his

A HEXAGONAL APIARY FOR FIFTY-FIVE HIVES.

bottom boards caught rain-water and drowned his bees; he had turned them over, and had left an opening at the back, as well as front. Level up your hives and bottom boards with a spirit level. The upper story is used for surplus honey in the summer, and for holding a thick chaff cushion over the bees in winter. The little hive above, contains two or three frames only, and is used for queen-rearing. I think I would have the entrances face different directions, after the experience I have now had, for once in a while, a young queen will get into the hive below, attracted probably by the loud hum of the young bees, as they happen to be returning from a play spell. I have never known but one such occurrence, but I think it will be well to have the entrances to the small hives, to the west, if we have all the large ones face the east, as we usually do.

An apiary of 50 or 100 hives, all arranged like the above, is a pretty sight to behold, I assure you; it adds to the beauty of it very much, in my eyes, to think that it is profitable as well as pretty, for I can hardly understand how we could have a season so poor, that such a well kept apiary, would not pay a handsome income. Our own, of about 75 hives, has, during the season of 1875, given us just about \$1,000 cash, for bees, queens and honey; about half the amount was honey. About \$100 was paid out for labor.



OUR HEXAGONAL VINEYARD APIARY.

We give you a diagram above, of our own apiary, vineyard and all. The square blocks, are supposed to be the hives; the lines on the south side of them, the grape vine trellises, for shade; the building in the center, the honey-house. You will observe that we have a railroad leading to the nearest wagon road; the car that stands on this railway, has its top on a level with the honey-house floor, thus greatly lessening the labor of loading honey for shipment, as well as getting our grape sugar for feeding during dry seasons. The car is simply a large shallow box turned upside down, with a post nailed securely into each corner. The axles and wheels are iron, and can be purchased cheaply at almost any foundry. The track, is 2x3 oak scantling. The ties are 1½ inch oak nailed on the under side. The honey-house has doors at each end, to facilitate carrying in honey. It will be seen that the most remote hive, is but 28 feet from one of the doors. The hives are 7 feet apart from center to center, and after trying different distances, I am satisfied that 7 feet is room enough, and that more is not needed.

LATER REPORT IN REGARD TO HEXAGONAL APIARIES.

May 17th, 1879.—In moving the bees to our new grounds, we filled the central apiary in just the manner shown on the previous page. They were all in one story hives, and to have them look nicely, we gave them all a fresh coat of paint. All were placed with the entrance facing the east, just as they were in our old apiary. Now I shall have to explain that our old apiary has a building in the centre, several trees scattered about (as you may remember), a house apiary, old, strong grape vines, and a great variety of objects, that might give the bees landmarks. This one was on the clean, green lawn, and not an object was to be seen, but the hives and a single stake, to which the grape vine was trained. Well, what do you think? I expect I might have known what to think. If you stood in front of a hive, first you knew, all of its bees were going into the next one. A few hives that had no bees in them, had about as many bees around the entrance, as the others. Bees heavily laden with pollen were running one way and the other, in front of hives, looking sadly puzzled because they could find no entrance, the entrances being closed up. Four hives, containing good colonies, stood in a row; a fifth one, an empty hive, was added, and almost before it was set down, a shower of yellow Italians, laden with pollen and honey, alighted, and commenced going in. You see they had marked *their* hive as the last in the row, and when another was added, of course they piled into that. Although in some trouble, I was obliged to shout in merriment, to see their astonishment, and I pitied them so much, they were given a frame of brood, and now they are a fair colony. I hereby give notice, that this is my invention for swarming bees automatically, and no body shall patent it. Just think how simple; set your new hive down, and the bees pile into it, almost before you get it leveled up.

What did we do with the beautiful hexagonal apiary? I called Mr. Gray, who is a genius for inventions, explained the trouble, and, in a twinkling, with the assistance of the engraver, we had each hive so that the bees knew it, and so that you could lay a pin on any one of the 60 hives, and go to it at once.

It was all fixed by turning the hives so that the entrances, instead of being all to the east, were turned to all points of the compass. Of course, we had it so that no two adjoining were turned in the same direction.

Suppose we take the north row of hives, and turn every other entrance west; we shall now have two entrances facing each other, and two backs facing each other, clear through the row. Now take the next row, and turn one entrance south, the next north, and so on through. Turn the third row, one east, the next west, and so on, as we did the first row. Now the fourth row, one north, and the next south, and so on. It is an easy matter for both you and the bees, to remember which way the entrance pointed, and as it is 14 feet in either direction before we come to another similarly situated, this brings the hive into another part of the apiary, or at least so far from any one like it, that there is little danger of confusion. The plan answers the purpose perfectly, and the apiary presents an orderly and systematic appearance to the eye.

FIXING THE ENTRANCES.

Our apiary is surrounded with evergreens as wind-breaks, but as these are not yet grown up, the location is much more windy than the old one, and the sawdust put around the alighting boards was blown about so badly, I was forced to think of something else. The handiest substance to keep down weeds and grass was coal cinders from the boiler room, but these were too dark colored. As I have explained before, I want the space around the entrance so clean that I can see dead bees, should there be any robbing, or even a dead queen, should one be brought out. I can often tell when a queen is replaced, by having a clean space in front of the hive, for if I do not see the body of the old queen, I am pretty sure to see the immature young queens dragged from their cells. Well, after we got the coal cinders nicely stamped down, we pounded up some clean, white sandstone, left after building, and made some nice white sand that we have spread over the cinders, making a door yard that will not easily be troubled with grass and weeds, and that neither sun, rain, or wind will disturb or discolor.

Well, to keep the grass down *between* the hives, we are now using a lawn mower, with much satisfaction. By running it through the alleys, in the three different directions, it leaves the ground just beautiful. The doctor said I would better go to California and stay a year, but I much prefer to stay in the apiary and run the lawn mower; and if you could see me this morning—June 27th—I guess you would decide the lawn mower would answer every purpose if “rightly applied,” especially since I have got through writing this book.

BOOKS ON BEE CULTURE.

I hardly know of a question that is asked oftener than the following: "I want a book on bee culture; what one shall I buy? Which one is the best? I want one that is plain, and tells a beginner just what to do; Where can I get it?" &c.

I would like to tell you just which one would be best for you, my friend, but I can not well do so without knowing something of your habits. If you read little, and do not care for the reason *why* you are directed to do so and so, I might tell you to take one of the brief text books or manuals; but, if you want to know all about the matter, or at least all that has been discovered up to the present time, I might think it best to advise you to purchase quite a little library. It is almost impossible to learn all that is known in regard to bees from any single book. If a cyclopædia were printed for that purpose, it would very soon have to be revised and enlarged, or it would not be up with the times.

No book can well be a complete substitute for our Bee Journals, not only for the reason given, but because one gets a better view of any science, by reading the experience of a great number of individuals. We are all liable to draw wrong conclusions, and to become set in our own way, but, by collecting and comparing facts from different authors, we, in a measure, steer clear of these mistakes, or errors of judgment.

Again, one will take up bee-keeping solely for the money that is to be made, while another cares little for the profit, but wishes to make it a study. The book that would satisfy one would not suit the other at all, although their line of work, much of it, lies in the same path.

I know of nothing that has ever been written, equal to *Langstroth on the Honey Bee*, for all general purposes, if the book were only up with the times. Many a beginner has heard it so highly spoken of, that he has sent for it, expecting to find in it all needed information; but finding that it contains no hint of the honey extractor that has enabled us to get over 500 lbs. to the colony in one season, nothing about the new comb foundation and section honey boxes, besides much else that has been, for a few years past, stirring our American people in regard to the place the honey bee is now taking in our industries, he has laid it aside, feeling almost, that he has been imposed upon. I have sold many copies, and it has been, too, with the fear that my patrons would, very likely, be disappointed in the way I have mentioned; but then I reflected, if they should throw it down, they would be pretty sure to take it up again, and, by and by, would learn to feel as I do, that there is no other book equal to Langstroth after all, even if it is deficient in the respects I have named; of almost everything that comes up, we shall find *something* said in Langstroth. The book is pleasantly and beautifully written, and the number of mistakes in it is less than is usually found in a book treating any one subject so thoroughly. The amateur, the student, and the gentleman of leisure, can not afford to be without Langstroth, whatever may be the discoveries in the science in the future. Price by mail, post-paid, \$2.00.

The book that comes next to Langstroth, and in fact the only one that can stand beside it at all, in many respects, is *Quinby's Mysteries of Bee-Keeping*. If one were intent on keeping bees solely for the money they would produce (and almost all of us take that view of the business to a greater or less degree) Quinby would be the man to follow, for he made his bees *pay*, and pay well, before movable frame hives were ever known. He had, in fact, reduced bee-keeping to a paying business with a certain profit, with his plain, cheap box hives. After reading his old edition over, I feel as if it would be rare fun, to keep bees in just such box hives now. Both of the above are very pleasant books to read, to one who is not a bee-keeper at all. Price by mail, post-paid, \$1.50.

Langstroth seems to have pursued his investigations with an enthusiastic love of getting at truth alone, and Quinby, with a desire of rendering the business less uncertain in a pecuniary point of view. While these two great writers started out, each without a knowledge of the other's work, it is greatly to the credit of both that they agree so nearly in all essential points. Since the above was written, Mr. L. C. Root, son-in-law of Mr. Quinby, has revised and almost entirely re-written Mr. Quinby's book, so that it is fully up to the present time, July, 1879. See Quinby Hive, in the glossary. The price remains the same as before, \$1.50, postpaid.

The *Bee-Keeper's Text Book*, by H. A. King, has had a large sale, and has done a vast amount of good. It is brief, and to the point, yet, like Langstroth and Quinby, was for many years much behind the times, until it was revised and enlarged in 1878. Price by mail post-paid \$1.00; in paper covers, 75c.

In 1876, Prof. Cook gave us a little *Manual* at 30 cents, and in 1878, a revised and larger one beautifully illustrated, and fully up with the times; price \$1.25. As entomology is friend Cook's specialty, he has given us great aid, in many matters almost untouched by any other writer. This is one of the advantages of consulting different books; one author may be an expert in entomology, another in the mechanical part of hive making, a third in botany, while still another may have been very successful in raising and marketing honey. Some writers, it is true, are quite proficient in all, but almost every writer has some particular specialty, in which he excels. We can mail any of the above books on receipt of price.

Everyone who aspires to become a successful bee-keeper should take one or more of our Bee Journals. As sample copies will be furnished by the editors, I need not attempt to discuss their respective merits here. A sample copy of GLEANINGS, which we always mail on application, will give you the address and price, not only of any of the journals, but of whatever you may need in the apiary.

DOOLITTLE'S REVIEW AND COMMENTS ON THE A B C BOOK.

In 1880 I offered friend Doolittle \$100.00 for a careful going-over of the A B C book, that he might point out its faults, and add such suggestions as his large experience might dictate. He has done this; and his remarks are of so much value that we have added them here. Where obvious errors were pointed out, of course nothing remained but to correct them, and so these points need not be given here. In some cases I have answered his objections, and in some I have not; in the latter, it will be understood that he holds one view, and I another.

1

ABSCONDING SWARMS.

CLIPPING QUEENS' WINGS.

Scarcely a queen need be lost, as a few bees will always gather around the queen; and by walking over the yard, and looking on the ground, this ball of bees is easily seen, and the queen picked up. It is not so easy, however, always to tell where they came from; but this can be done by keeping them till near night, and taking the queen from the bees, when they will return home to their own hives.

Very good indeed! The idea of letting stray bees find their own hive is a new one—to me, at least.

2

SAVING AFTER-SWARMS, AND BUILDING THEM UP TO GOOD COLONIES.

I can not agree here. With the after-swarms goes all prospect of surplus honey; and, if prevented, the old stock is by far the better. Wait $7\frac{1}{2}$ days after the first swarm leaves, and, as a rule, the first young queen is hatched then. Cut all cells, and after-swarms are done away with.

3

PLURALITY OF QUEENS IN A SWARM.

I find that a plurality of queens is just as common in second swarms as in third; and I have had as many as half a dozen in a first swarm, issuing from the loss of the old queen ten or more days previously. During the height of swarming, the cells are not properly guarded, and thus the young queens run out.

4

CUTTING OUT CELLS, AFTER A FIRST SWARM ISSUES.

This is not sure, as the bees can rear more from the brood remaining; but, cut them after the first queen hatches, and you have a sure thing.

5

SETTING THE NEW SWARM IN THE PLACE OF THE OLD STOCK, TO PREVENT AFTER-SWARMS.

This is not a good plan with the Italians, as they will nearly always swarm after being thus moved; but with the blacks it generally works well.

6

AGE OF BEES.

HOW LONG BLACK BEES WILL LIVE, IF AN ITALIAN QUEEN IS GIVEN THE BEES IN MAY OR JUNE.

They will live 45 days, from three experiments I have tried.

7

ANGER OF BEES.

Have you not made a mistake here somewhere? During a heavy yield of honey, our bees seem to be glad of a rest, and it takes at least 24 hours before our bees think of robbing, after a full flow of honey. We have taken off honey after a shower, as you speak of, when each bee was so full of honey that, if squeezed a little, she would throw the honey out on the tongue; and, if jammed a little, the honey-sack (filled with honey) would burst through the sides of the abdomen. After 24 hours has elapsed, or the season draws to a close, we agree with all you say.

I hardly think I have made a mistake in the matter, friend D.; but, very likely, more time had elapsed after the rain, than what I have given. I have noticed all you say, *immediately* after a very heavy yield; but so many others have spoken of having trouble in trying to extract, after a storm, that I can not but think my caution a wise one.

8

I thoroughly tried Prof. Hasbrouck's plan the past season with the sugar-barrel with a hole in the top and a glass on the inside. While I could get the drones and queens to fly together and drop to the bottom in the embrace, or laying-hold of each other, yet not one was fertilized.

In regard to this same subject of artificial fertilization, I remark that now, nearly every apiarist of 50 hives or more, has at least one imported queen. In regard to this remark, friend D. writes:—

9

I can not agree here. I have had three daughters of imported queens from as many breeders, and none of them commenced with the stock I had taken pains to breed for honey. With the majority of apiarists, probably, your remarks are correct; but we have a few breeders whose queens are far ahead of a promiscuous importation from Italy,—at least

such is my opinion. Five hundred dollars would not hire me to breed all my queens from an imported mother, and let my present stock go down.

If better honey-gatherers can be obtained by going elsewhere rather than Italy, by all means let us have them. As friend D. now offers queens for sale, we can give his stock a very thorough test the coming season

10

ARTIFICIAL SWARMING.

HOW TO REAR QUEENS.

The first-hatched queen will destroy all remaining queen-cells, providing it is not in the height of a flow of honey. If it is, our experience is, they will swarm instead. For my views on this, see A. B. J. for Oct., 1880—Doolittle's article.

The reference to the article on queen-rearing is, I presume, in regard to friend D.'s position that queens reared under the swarming impulse, are better than those reared in the manner I have given. If this were the case, should not apiaries managed on the natural-swarming principle, produce superior queens? There are plenty who have followed the latter plan all their lives, but I do not learn they have more honey to sell, than those who have made their swarms and reared their queens according to the methods I have given. It seems to me, friend D. and our good friend Prof. Cook too have been a little thoughtless in their condemnation of all queens sold for a dollar, as if they were necessarily inferior on that account,—especially after the great numbers of great yields that have been reported from the progeny of queens that were purchased for a dollar, and in the hands of A B C scholars at that, but it is possible that those reared from natural swarming will be better yet, other things being the same; and let us by all means give the matter a fair test. If friend D. can supply the demand for such, even at \$3.00 each, we shall very soon have plenty of reports from them.

11

BASSWOOD.

In a period of 12 years, I have never known basswood to fail to yield honey,—the very shortest season yielding 4 days, and the longest 20. I place basswood at the head of all honey-producing trees or plants as to yield. From it I once obtained 66 lbs. in 3 days, from one hive.

12

This is a picture of which you may well be proud; for a better picture to convey to the mind just what basswood is, was never executed.

13

I obtained *sixty-six* lbs. in three days.

14

BEEES.

BEEES, HOW THEY GROW.

You do not mention water as being mixed with the honey and pollen for food. If water is not mixed

with this food, why is it so eagerly sought in spring and summer, and not at all in warm days in October and November? Now, I claim that many things point to water being one element in this food.

15

BUCKWHEAT.

We have given up placing any dependence on buckwheat for honey. It has yielded honey only 5 times in 12 years, so that any was stored. See our report for 1880.

16

CANDIED HONEY.

SEALED COMB HONEY IN A CANDIED STATE.

Sealed honey seldom candies in the hive as you say; but I never, to my recollection, had sealed honey away from the bees over winter without its candying.

17

SCALDING.

How about changing the flavor as soon as honey is scalded? Our experience is, that honey that has been heated hot enough to scald is spoiled, or nearly so, in flavor.

It can be heated so as to prevent candying, without in any way detracting from the flavor, I think, friend D.

18

CLOVER.

RED CLOVER FOR HONEY.

If I understand you correctly here, you and I do not agree at all. I never pulled the blossoms from a head of red clover yet, but that there was honey in them. But I have frequently found the corolla so long the bee could not touch the honey, I think there is nothing in the world that secretes as much honey, year after year, as red clover; still, it is of little use except to the bumble-bee.

In our locality, the red clover certainly contains no honey, perceptibly, some seasons. I am always in the habit of plucking the heads and sucking out the nectar, whenever I find them in bloom; and whenever I can squeeze out quite large globules, I always, so far as I can recollect, find the bees gathering honey.

19

TAKING SECTIONS OFF THE HIVES, BEFORE THE CELLS ARE ALL CAPPED.

Quinby said, and with much truth, too, that all boxes two-thirds full of white honey should be taken off before buckwheat honey was stored in them at the beginning of that yield, as partly filled boxes of white honey would bring more than when finished out with dark honey. If you will adopt the plan of storing it in a warm room for a month, all your advice will not be needed, as in that case unsealed honey will not heat or run in the least.

20

DANDELION.

This blossoms just with fruit with us, and so is of little account, except the little they get before and after, at beginning and ending.

Dandelion honey, after it is a year or two old, is just splendid.

21**DISEASES OF BEES.**

Can't you manage to tell us why bees did not spring-dwindle prior to 1870? When I first commenced to keep bees, there were 100 swarms around me, kept by four or five parties that had kept bees for 30 and 40 years; and, although they kept on using box hives, still not one of them has a bee to-day. Tell us what did it. I confess I can't see through it at all.

To come right down to the point, I can't either, friend D., even after all the learned and exhaustive articles we have had on the subject. Once they lived almost without care, and now they don't.

22**DRONES.****AGE OF DRONES.**

Fultz, of Muscatine, Iowa, says, in *A. B. J.* for January, 1880, that drones live only 24 days, while I claim they live to about the same age as a worker, if the bees allow them to live that long.

23**EXTRACTED HONEY.****DOOLITTLE'S ARTIFICIAL HONEY.**

Take and make a syrup of A sugar, of the consistency of honey; then for every 5 lbs. of this syrup, put in 3 lbs. of clover or basswood honey, and thoroughly mix, and there is not one in twenty but will prefer it to clear honey, and not one in ten that can detect it by the taste.

24**RIPENING EXTRACTED HONEY.**

I am just one of those persons who have proven to their entire satisfaction, that there is no difference between honey extracted before it is sealed and ripened in an open cask or can in a warm room, and that sealed by the bees, and ripened in the hive.

25**EXTRACTING UNRIPE HONEY.**

I think your honey, when first gathered, must be very poor stuff, or else you are carrying this thing too far. We have tiered up hives, as you tell, and left till October, then used in the comb, and extracted it by warming the combs so we could, and for the life of me I could see no difference between this and some I warmed that was taken before it was sealed. Both were so thick you could turn a saucer over, as you tell, and not have it run out, and so clear you could read through it six inches deep. Just tell your readers to extract when they will, but ripen in open cans in a warm room.

26**DADANT'S HONEY-PAIS.**

Candied honey in Dadant's pails is selling well in all the markets we have tried, and it is by far the nicest way to put it up.

27

Don't say tin cans are "next best," but say, *the way to keep honey is in tin cans holding 300 lbs., in a warm dry room, with a cover made of your duck cloth. If you want to sell it in that shape, fill the Dadant pails just before it ceases to run, and set them away.*

28

With tall hives there will not be 10 lbs. below if

you keep extracted from the upper story, at least this is our experience.

It is to be remembered that friend D. uses the Gallup frame while my remarks are all for the L. frame.

29**FEEDING AND FEEDERS.****FEEDING BACK.**

Haven't you changed your mind on this feeding back? I have again tried it this season, only at a loss, as I have to feed 2 lbs. to get one in the boxes. Betsinger and my neighbors succeeded no better.

I agree with you that such is the case exactly until the brood apartment is crammed; but after that, there are not more losses than I have mentioned.

30**THICKENING WATERY HONEY.**

If this is so, how came your thin honey from basswood you told us about a little while before on these pages? Why did they not thicken this in the same way? I still believe all evaporating of nectar is done in the hive, as I once wrote.

I should explain it thus: The basswood yielded in such quantities that they carried it right to the hives. The Simpson plant furnished only a limited amount comparatively.

31**FOUL BROOD.**

If you don't give them any comb, they don't want any confining, as I repeatedly found in 1871, '2, and '3. A new swarm from a diseased hive, hived in an empty hive, will never have the disease, unless they get honey after the larvæ has hatched from a hive that has the foul brood; so your "starving part" should be left out. I ought to know, as I renovated my whole apiary in 1873.

32**FRUIT-BLOSSOMS.**

Betsinger says, and I agree, that if we had the same number of bees in a hive in apple-bloom that we do in basswood, the yield would be as great. I once had 8 lbs. stored in one day, with not over one-third the bees I have in basswood. Apple is a great yielder of honey, sure.

Then we have a most excellent reason for having *powerful* colonies to commence the season with.

33**HIVE-MAKING.**

A good colony of bees will store almost as much honey in a half-barrel or nail-keg, as in the most elaborate and expensive hive made, other things being equal.

If I am correct, it was E. Gallup who said this; E. Gallup certainly said it, and Quinby may have done so; but I do not remember that he did.

34

How -- it, friend Root, that when you write a book you give only a description of *your* hive? When L. C. Root writes a book he gives a description of the Quinby hive only. Has not Prof. Cook set you both a good example by giving several, and then giving his reasons for adopting the one he uses? As you

know, I do not agree with you on hives, and think you are prejudiced on many points; but I have gone over the ground so much in the bee journals, that I will not say more here, except to say that, if I used the L. frame, I certainly should use side boxes as well as top; and as I took out the full ones on top, raise the partly filled ones from the sides to the top, placing the empty boxes at the side each time. This is the principle to secure a large yield of box honey, and we think we have proven it to you by our reports the past eight years. Still, you do not even mention the matter, but drive ahead as if yours was the only way. Please excuse, but so it seems to me. I know you consider the interchangeable side and top boxes complicated; but can't we well afford it, if from 5 to 10 lbs. extra can be secured from each stock each year thereby?

I know, friend D., that this matter of hives is a very important one, but if Quinby and Gallup were right, as in a few sentences back, does it really matter so very much? I have described minutely how to make both summer and winter hives for the L. frame; but if anybody prefers any other sized frame, they can vary the directions to suit, without any great difficulty. I have not described the hive preferred by yourself, Prof. Cook, L. C. Root, Dadant, Harbison, and many others, because it would make the book too voluminous for one thing, and because I could not give directions for each operation all the way through, without modifying all the time, to suit the different hives. Besides, I should perplex and confuse the beginner beyond measure if I tried to do so. Even though Prof. Cook uses your sized frame, he uses a differently made hive; and, if I am correct, you would hardly agree with his directions any more than you do mine. Friend Cook gives a general idea of the whole subject, without going into minute details as I have, and his book in this respect fills a need that many of the others do not. In deciding to have my whole book written principally for the L. frame, I did it with the belief that you would do nearly if not quite as well with that frame as with your own, and also that by far the greater part of our bee folks had that frame already in use. To advise everybody to throw away the hives they have, and adopt another, would be a most serious matter, and I have not intended so to do in any thing I have written; but I would advise all new beginners to fall into the great beaten path as far as may be, in deciding upon implements to be used. I feel now as I did at first, that it is best not to confuse beginners by attempting to describe more than one frame, and the summer and winter hives for holding this one frame. I indorse your idea in regard to raising up the side boxes. Under

COMB HONEY I have given full directions for using the sections at the sides as well as above the brood frames.

35

THE 1-LB. SECTION BOX.

Would it not have been well to have told your readers that Manum, of Bristol, Vt., made a section that was nicer than any thing could be that was planed, and that, too, with nothing but a saw, and that it held 1½ lbs.? that Betsinger made prize boxes that were very nice that held 2¼ lbs. glassed? that Hetherington, the largest bee-keeper in the world, used a box still different than Thorn & Co., and Thurber & Co. pronounced the best for New York market of any thing there was used? How should I know of any thing but 1-pound boxes if I did not read it elsewhere outside of this book? Many can not afford to buy several books, and so want to be posted by reading one.

I have described but the one section, for the same reason I have described but one hive. I do not wish to confuse my reader and leave him in a broad sea of uncertainty as to what style he had best adopt. Should he choose the hive I have described, and then try to use some of the other forms of sections, without experience, he would be likely to have the same troubles so many of us have gone through with in patching up and trying to make system out of chaos. Harbison produces more comb honey than any you have mentioned, and he uses still another box; but I have not described it. I have once given a letter from Thurber, saying the 1-lb. section sold the best of any in the market; but he may have given different opinions at other times. Hundreds who had no knowledge of bee culture at all, have, by following the plan and direct teachings of the A B C, succeeded at once, rejoicing at every step; but had I taken in all these other points (and I grant they are important), I can have no idea that such would have been the case. As it is, every implement, box, frame, and tool, fits exactly with all there is in the book. Had I described and advised the things used by others (even though they are better, mind you), such could not have been the case.

36

HONEY-COMB.

BEES PACKING IN THE COMB COMPACTLY.

Betsinger says that the bees never pack themselves in the cells except in cases of starvation. I am not posted, so can not say from my own experience.

As I have often pulled combs apart in winter, and found them thus, I can not quite agree with friend B.

37

IS IT THE RESULT OF AGES OF SURVIVAL OF THE FITTEST?

Now, really, friend Root, do you think bees build

comb any differently than they did when the great Creator pronounced all his works good? That there is a difference in the qualities of bees, I know; and so I believe there was then. If God knows the beginning from the end, he knows just what is wanted, and so makes it good. We have no reason to believe that there has been much improvement made, as a whole, since the creation, if any thing; for wherein one point is gained, another is lost; for instance, man has perhaps a better intellect to-day than he had 3000 years ago, but he does not live a tenth part as long. So with our choice breeds of cattle, sheep, etc.; the more choice they are, the more petting it takes to keep them up, while the lean, uncouth "scalawag" will live and thrive anywhere.

38

MAKING BEES USE LARGER CELLS.

We tried to so improve the bee as to make them take cells $4\frac{1}{2}$ to the inch, but we had to give it up, and believe God knew best when he taught them that five is right.

39

HYBRIDS.

WHY DO HYBRID QUEENS BRING ONLY $\frac{1}{4}$ PRICE OF ITALIANS?

Just because anybody and everybody can raise plenty of hybrids themselves, if they have an Italian to start with; but if they have a queen producing hybrid workers, they soon have nothing but blacks

40

BLACKS ARE MORE TROUBLESOME ROBBERS THAN EITHER HYBRIDS OR ITALIANS.

I have had pure Italians that were ordinarily quiet and peaceable get so roused up as to sting worse than any hybrid ever thought of stinging.

41

You are just right here; and still we have those who claim the Italian is superior to the blacks, only as they rob others. I have been so annoyed by these black chaps following me around, as to get fairly nervous.

42

INTRODUCING QUEENS.

FINDING THE OLD QUEEN.

would say, draw one of the outside brood combs, for the queen is oftener found on the outside brood combs during the day than she is on the central one.

43

THE "PEET-CAGE" PLAN OF INTRODUCING.*

I have succeeded to my entire satisfaction the past summer in introducing queens by making a cage as you used to, to cage queen-cells; and make it so it is 4 inches square; find a place where the bees are hatching out rapidly, and place your queen thereon, after getting all the bees off; then place your cage over the queen, and press into the comb. Of course, you must have some cells of honey inside the cage too. As the bees hatch, they become attached to the queen, and she commences to lay in the vacant cells, and in from 24 to 48 hours she will fill them all, and these young bees will protect her after you have lifted the cage from off her and them.

44

ITALIAN BEES.

IS FRESHLY IMPORTED STOCK BETTER AS HONEY-GATHERERS?

Can't "swallow" that yet; and I candidly believe further importation is useless for the next five years.

*A cut and description of the Peet cage will be found at the end of the subject QUEEN-CAGES.

45

THE FOURTH YELLOW BAND.

I have had those on which the fourth was just as visible on the honey-scale as it usually is on the third, and that while they were on the window.

I have also seen them during the past year—especially on the Cyprian and Holy-Land bees.

46

LAMP NURSERIES.

Are not your queens weak and feeble if hatched in the lamp nursery? Mine were so much so that, after using it two years, I laid it to one side, and have not used it since. Queens hatching over a swarm of bees in a wire-cloth cage seem to be as strong again.

I have not found it so, friend D. See Hayhurst's letter at close of subject QUEEN-REARING.

47

LETTING NEWLY HATCHED QUEENS INTO A HIVE WHEN A LAYING ONE HAS JUST BEEN TAKEN OUT.

Out of 20 so let in the past season, I lost all but one, and had nearly as bad success before; so I should say, if I were writing a book, that, as a rule, all so let in would be killed.

48

UNSEALED HONEY GETTING THICK IN THE LAMP NURSERY.

A good argument in favor of my theory in ripening extracted honey, and also of keeping box honey till it is so thick it will not leak from unsealed cells. We have faith enough to believe that, if you were to once store your box honey in a room that maintains a temperature of 90° for three weeks, you would never ship it as it came from the hives.

49

MOTHERWORT AS A HONEY-PLANT.

As I said at the Chicago convention, so I say now: if I were to cultivate any plant for honey, it would be Motherwort; for our bees work on it from morning till night for weeks.

50

MOVING BEES.

HOW FAR DO BEES FLY FOR STORES?

You know we don't agree here, as I claim they go from 3 to 6 miles from choice. My bees went 4 to 5 miles to work on teasel the past year, without any teasels within $3\frac{1}{2}$ miles on the first part of the route. This I know, as a bee working on teasel is always partly covered with a whitish dust, as they are with yellow when working on pumpkin and squash.

Thanks; very likely I have put the distance too small.*

51

NUCLEUS.

HOW FEW BEES, WITH A QUEEN, MAY START A COLONY.

We once had a colony become so reduced that, by actual count, there were 81 bees and the queen, and so they held on till warm weather, when they built up without help, and actually gave a surplus of 5 lbs. on buckwheat, in sections, and were in splendid condition for winter.

52

IS THE GALLUP FRAME TOO DEEP?

I don't see how you can call the Gallup frame deep, when it is only two inches deeper than the L. frame. If you had said the old American or Kidder

*An article in April No. of GLEANINGS for 1882, shows conclusively that Italian bees will fly from an island, under favorable circumstances, as much as even SEVEN miles.

DOOLITTLE'S REVIEW AND COMMENTS ON THE A B C BOOK.

that were 14 inches, I could have agreed. The Gallup frame is the best proportioned frame of any, all things considered. So think I.

53

DOES THE BOTTOM PROJECT BELOW THE CLUSTER?

No more than the ends do, for it is exactly square. A good swarm of bees in the Gallup frame will touch the bottom and top of the hive, and also each end where only 9 frames are used, but not the sides; while with the L. frame they touch the bottom and top only.

Why, friend D., it seems to me our bees don't act just as yours do, but perhaps we are both a little prejudiced.

54

NUCLEUS.

How is it that you have only seven frames in this hive, when you say you use ten in the chapter on hives?

We usually use but 6 or 7 *brood* frames; in winter, chaff division-boards take the place of the other three, and in summer, a frame of sections on each, outside.

55

POLLEN.

BASSWOOD YIELDS NO POLLEN.

If I am correct, basswood yields no pollen at all.

56

BEES ON CULTIVATED-GRAPE BLOSSOMS.

Did you ever see a bee on a tame-grape blossom? Although they get pollen freely from the wild, or frost-grape, yet I never saw one on a tame variety.

Yes, sir! they work on our Concord's nearly every season.

57

DO BEES SEE OR SMELL HONEY?

Above, you give that the bees find honey by seeing the blossoms, etc.; but did they go into the honey-house by seeing the bowls and boxes of honey there? I think not, and guess you have got off the track. It can be easily proven, that bees are drawn toward honey by the perfume, for you can place it where they can see it all day, and yet yield no perfume, and not a bee will notice it.

58

DO BEES OR PLANTS CHANGE THEIR HABITS, UNDER DIFFERENT CIRCUMSTANCES OR SURROUNDINGS?

Is not this figurative language? The touch-me-not is probably just as it was when it was first created; if not, God did not know the necessities of flowers when he created them. That a flower has "learned" how and where to place certain organs to accomplish desired ends is a little strange talk, is it not?

59

POLLEN AND BROOD IN THE SURPLUS BOXES.

I find it right the opposite. I never had any brood in the side boxes but once in my experience, that I know of, but often have it in top boxes.

60

PROPOLIS.

PROPOLIS FROM BALM OF GILEAD AND POPLAR.

I have repeatedly seen bees getting propolis from balm-of-Gilead and poplar buds, and a few at work on the horse-chestnut; but this is so sticky they do not like it so well.

61

QUEENS.

DOES THE QUEEN OR WORKERS DESTROY RIVAL QUEEN-CELLS?

As far as my experience goes on this point, the workers do this destroying of the cells. I know queens do tear open cells, but believe the workers do most of it when the idea of swarming is not entertained.

62

PIPING OF QUEENS.

I guess no piping is ever heard in a hive till one queen has hatched; at least, I never could hear any, and I have experimented quite thoroughly on this point.

63

WHAT DO BEES FEED THE QUEEN TO MAKE HER LAY?

What is this food that the bees feed the queen? I claim it is the same as that fed to the young larvæ. When the queen takes honey, she helps herself to it.

64

AT WHAT AGE DO QUEENS COMMENCE TO LAY?

I once had a queen laying in just ten days from the time the cell was sealed over, or three days after the queen had hatched, and at another time I had one that did not lay till 26 days from the sealing of the cell.

65

QUEEN-REARING.

INSERTING QUEEN-CELLS AT THE TIME THE NUCLEUS IS MADE.

I have tried this plan till I know that my bees destroy at least nine-tenths of all cells so given, and do not understand why yours do not. With my experience, I should not put such a plan in a book, if I were to write one, but would say, wait 24 hours.

66

KEEPING THE BEES OF THE NUCLEUS FROM GOING BACK HOME.

I should say that this one would get half the bees that were in the old hive; at least, when I make nuclei in that way the bees seem bent on going back to the old stand; so I generally confine them for the first day, letting them out toward sunset by the second day.

67

INSERTING A CELL IN PLACE OF ONE THE BEES HAVE BUILT.

That is correct; and I say, wait till they commence to build cells, and you are safe.

68

ROBBING.

WHAT TO DO WHEN A COLONY CEASES TO DEFEND ITSELF.

I cover the hive all up with a large sheet, and then there is no chance of smothering; and, also, the robbers are not confined to the hive.

69

A ROBBED COLONY GOING HOME WITH THE ROBBERS.

Did anybody ever know the bees from a robbed hive to go home with the robbers? I never knew such a thing to happen, and doubt its ever occurring.

I have had a few cases of the kind, and several have been reported. Perhaps, friend D., you do not have the experience(?) in robbing we do.

DOOLITTLE'S REVIEW AND COMMENTS ON THE A B C BOOK.

70

DO BEES DISLIKE SNAKES?

I had plenty of snakes live under my hives the past summer, and the idea that bees dislike snakes is all bosh.

71

SMOKERS.

SMOKE FOR YELLOW-JACKETS.

Smoke will drive yellow-jackets and bumble-bees much quicker than it will bees, so they will leave their nests entirely — the yellow-jackets rarely returning, but the bumble-bees will return.

72

STINGS.

HOW DOOLITTLE MANAGES IN REGARD TO STINGS.

This is the way I always remove them; and if you learn by instinct, as it were, to strike your hand against your clothing at the moment you feel the strike to sting, you will, in nearly all cases, remove the whole sting, and suffer scarcely any pain. I always wear a veil, as I don't want them in my face if they did not sting at all.

73

VISITORS STANDING IN FRONT OF THE HIVES.

This is the worst trial I have, and I sometimes feel like telling such persons that it seems as if they should "know something;" but instead, I request them to come back where I am, only to repeat it when I open the next hive, and so on.

74

KILLING BEES IN HANDLING HIVES.

I think you make more of killing bees than is called for. When a bee's life is worth more to me than my time is, I take much pains to prevent killing one; but, on the contrary, if my time is worth more than the life of a bee, the bee is killed, always striving to kill as few as possible consistent with accomplishing what is to be accomplished. We keep bees for the profit there is in them, and that is what they were created for — the benefit of man. Do you object? Let us see: you keep a cow for the profit there is in the milk and butter she affords you to eat or sell; but when she gets old, so as to be of no value for milk or butter, do you keep her for the good she has done? No: you look to the profit again, and fat and kill her, and, as you reason, God should hold you responsible for this act. Why not? Because he has created the cow for the benefit of man, as he did the bees; so when a bee's death is more profitable to me than his life, there is no more harm in killing him than there is in killing the cow.

75

USING SMOKE IN OPENING HIVES.

I always blow a little smoke under the quilt as I raise it, and after that use no more unless they show signs of stinging. In this way no time is wasted to have them off from the tops of the frames out of the way. Any colony can be subdued by blowing in a little smoke at the entrance, and closing it, and then rap on the hive a few times. In two or three minutes you can do any thing with them.

76

SWARMING.

NON-SWARMING HIVES.

Why not say bees swarm because it is God's plan to keep them from becoming extinct, as much as it is his plan for the birds to return to us each spring, mate, and raise their young? With an apartment

that is suited to the bees for all seasons of the year, that is not enlarged or contracted by man, the bees invariably swarm if the season is propitious, and all the combined ideas of man have not as yet been sufficient to produce a non-swarming hive when worked for comb honey, that was reliable.

77

DO BEES WORK LESS THE DAY THEY ARE GOING TO SWARM?

I never could see a bit of difference as to the work of a swarm, and I have watched closely to see, when I knew a swarm had a sealed queen-cell.

78

BEES SWARMING BECAUSE THEY HEAR OTHER HIVES SWARMING.

No mistake, as far as my experience goes.

79

FIRST SWARMS ISSUING TWICE ON THE SAME DAY.

I never knew but one first swarm to issue the second time on the same day — a returned swarm, I mean.

80

REMOVING THE QUEEN WHEN BEES ARE AT WORK IN THE BOXES.

Both Elwood and Hetherington now take away the queen from their stocks at work in boxes during the basswood bloom, and claim that is the correct way to get box honey with no swarms. I do not yet agree, but may some time.

81

EXTRACTING THE HONEY TO PREVENT SWARMING.

I don't agree; your extracting reduces them, for the time being, to a state of poverty, the same as a dearth of forage; hence, all idea of swarming is given up the same as it is when the flowers yield no honey, on the principle that God has given them knowledge enough to know that they can't prosper outside of the old hive without a yield of honey.

82

TEASEL.

I have never known it to fail but one year during the past eleven years, the time I have kept bees.

These road-side teasels are wild teasels, on which I never saw a bee in my life. These have a blue blossom, while the tame, or Fuller's teasel, have a white.

83

TRANSFERRING.

DRUMMING THE BEES OUT, IN TRANSFERRING.

Why don't you drum out those bees to start with, and have them out of the way?

Because I like the way I have given, best.

84

DOOLITTLE'S NATURAL COMBS, VERSUS THOSE BUILT ON FDN.

I have 1000 that I would not trade with you even handed at venture, for they are perfection.

If you had to buy your fdn., I think you would save all the comb you could.

85

The drumming is done by getting off the side of the old hive, and getting the nails out of the cross-sticks so no time is wasted.

86

UNITING BEES.

Alternate the frames, and thus mix the bees thoroughly, and they will never fight at any time of the year.

DOOLITTLE'S REVIEW AND COMMENTS ON THE A B C BOOK.

But they do *sometimes*, friend D., *with us*, nevertheless. I wish you would try uniting Cyprians in that way.

87

LOSING QUEENS WHEN UNITING BEES.

I never lost one in my life.

88

WHEN TO UNITE BEES.

I don't agree. August is the time to unite bees, as I gave in *A. B. J.*, Oct. No. The first part of Sept. would do, where fall flowers are abundant.

It is far easier to unite bees in the brood form in August than in the bee form in October, for the brood the last of August are the bees of October.

89

VEILS.

I use the grenadine for the whole veil, and wear one most of the time.

90

USING SHEETS OF MICA IN BEE-VEILS.

The mica does very well in hot weather, but in cool the breath steams it up so it is entirely useless.

91

VENTILATION.

KEEPING SURPLUS BOXES WARMLY PROTECTED, WHEN THE BEES ARE STORING HONEY.

You are just "shouting" here, and this is one great secret of success in getting box honey.

92

VINEGAR.

Vinegar is also used for cleansing wax. See p. 269.

93

WATER FOR BEES.

EVAPORATING THIN, NEWLY GATHERED HONEY.

For my views on this matter, after conducting many careful experiments, see "Evaporating Nectar," on p. 172, Vol. 3, *A. B. J.*

94

WINTERING.

FEEDING UP FOR WINTER.

Why not feed the whole 20 lbs. in one or two nights if they have plenty of comb room and plenty of brood and young bees? That is the way I do.

95

CELLAR WINTERING, AND OUT-DOOR WINTERING.

Notwithstanding there are probably at this date more bees wintered in cellars than any other way, I winter half of mine in a cellar, and half on summer stands, so I am sure of being right in one place or the other every winter.

96

DOOLITTLE'S BEE-CELLAR.

My bee-cellar has not raised three degrees during the winter since I built it, and we have had weather all the way from 20° below zero to 65 above. Two or three days of 65° above does not affect it a particle; I do not use a stove as do Elwood, Root, and others.

97

WHY BEES WINTER WELL ONE WINTER, AND DO NOT ANOTHER, UNDER THE SAME CIRCUMSTANCES.

This is candid, and I agree exactly. No one can tell why two swarms, sitting side by side, as near alike as two peas, should not winter alike; and yet,

often one dies before March, while the other comes through a splendid colony.

98

FASTENING BEES IN THE HIVES IN WINTER.

Packed in chaff, as you propose, bees do not need an entrance at all, especially in the cellar, and out of doors only where they can fly. Hence I close mine as tight as I can make them at the bottom in cellar, and generally do those out of doors.

99

WHEN TO TAKE BEES OUT OF THE CELLAR.

As you advise waiting till pollen is plenty (which advice is good), your advice as to the time of day in putting out is bad, as it is so warm at this season of the year that robbing will likely result from those set out previously, or from those wintered on summer stands. Set out when sun is an hour high, on a warm day, and they will have a nice fly, and protect themselves the next morning.

100

WEAK COLONIES THAT CONSUME SCARCELY ANY STORES, COMPARATIVELY, NOT BEING OF MUCH VALUE.

Beg pardon, but this is not so. The colony that consumes the least stores in cellar wintering is always the best colony in the spring, and the one that will remain quiet till pollen is plenty. Now set them out, and you will have no spring dwindling, but each bee in the hive will be strong and vigorous, and as the weather is warm, they rush things.

I agree with this, but my remarks were meant to apply to those so small they could not need much.

101

NO. OF STOCKS IN A PERFECT CELLAR, NOT IMPORTANT.

With a cellar like ours it makes no difference whether there is one or 100 colonies in it, as it is not dependent on the bees for warmth, but it is the temperature of the ground at a depth of 8 feet, and that temperature is from 43 to 45 degrees above zero.

102

BEES THAT ARE FOUND ON THE FENCES AND WALKS IN THE SPRING, LADEN WITH POLLEN, ETC.

I believe these bees die of old age, caused by a used-up vitality from holding the excrement so long, as I gave in the *A. B. J.*, which friend Roop and others "blowed" about so much. If you will consider, you will see that all evidences point that way.

130

SAVING SOILED OR MOLDY COMBS.

This sounds better than what you say on page 250. I believe it well pays to save all pieces of worker comb 6 inches square. This you *save*, while *fdn.* costs money.

Friend Root:—Although I have been pressed for time and hardly knew how to do it, I have thoroughly read the preceding pages and criticized what I considered wrong. I may not have clothed my language with as smooth a dress as some would have done, but believe me, I have not intended to be harsh and if you find any thing that so sounds please forgive, I did not intend any thing but kindness.

G. M. DOOLITTLE,

Borodino, N. Y., Nov. 1, 1880.

